Finished @ 1:40PM > 2-7/18

Start 12:35 2/7 cm NAME: Gloire Rubambiza

Instructions

- Put your response to each question on a separate page and include your name and the problem number on each page.
- You do not need to attempt all of the questions. Work on the ones that you feel ready for and have time for.
- You may use scratch paper, a calculator, your texts, and your notes. Please do not use any network enabled device (smart phone, computer, tablet).
- You are welcome to discuss questions with your instructor for clarification.
- On the chart below, indicate which of the problems that you attempted should be assessed by circling the problem number.

NR

1	2	3	4	5	6	7	8	9

Table 1: Problems Attempted

1. **MC1** I can determine whether a small number is prime, and factor an integer into its prime factorization.

   MC2 I can find the greatest common divisor/greatest common factor of two positive integers and determine whether two integers are relatively prime.

   For each pair of integers, find their prime factorization and use it to find the greatest common factor of the pair.

   (a) 77 and 23. $7 \cdot 11 \cdot 1$ | $1 \cdot 23$ gcf = 1

   (b) 91 and 161. $91 \cdot 1$ | $161 \cdot 1$ gcf = 1

   (c) 126 and 135. $2 \cdot \boxed{3 \cdot 3} \cdot 7$ | $\boxed{3 \cdot 3} \cdot 3 \cdot 5$ gcf = ~~3~~ 9

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Assessment 1

2\. a) $100 - 45 = 55$

$45 - 0.55 = 45$

$55 - 1.45 = 10$

$45 - 4.10 = 5$

$10 - 2.5 = 0$

$gcf(45, 100) = 5$ ✓

b) $29 - 1.19 = 10$

$19 - 1.10 = 9$

$10 - 1.9 = 1$

$9 - 1.9 = 0$

$gcf(19, 29) = 1$ ✓

c) $64 - 2.25 = 39$ $64 - 2.25 = 14$

$25 - 0.39 = 25$

$39 - 1.25 = 14$

$25 - 1.14 = 11$

$14 - 1.11 = 3$

$11 - 3.3 = 2$

$3 - 1.2 = 1$

$2 - 2.1 = 0$

$gcf(64, 25) = 1$ ✓

3\. (a) $(88 + 67) \bmod 7$

$= 155 \bmod 7$

$155 = 7.22 + 1$ ✓

$\Rightarrow (88 + 67) \bmod 7 = 1$ ✓

3. (b) $(13-67) \bmod 7$

$-54 \bmod 7$

$-54 = (-7 \cdot 7) - 6$ $\quad -7\cdot 7 - 6 = -55$

$\Rightarrow (13-67) \bmod 7 = 6$

$(13-67) \bmod 7 = (-54) \bmod 7$

$= (-8 \cdot 7 + 2) \bmod 7$

$= 2$

(Or, -54 is 2 <u>more</u> than a multiple of 7)

(c) $(575+919) \bmod 2$

$1494 \bmod 2$

$1494 = (2 \cdot 747) + 0$

$\Rightarrow (575+919) \bmod 2 = 0$

(d) $(14 \cdot 7) \bmod 26$

$98 \bmod 26$

$98 = (3 \cdot 26) + 20$

$\Rightarrow (14 \cdot 7) \bmod 26 = 20$ ✓

4. a) The additive inverse of 12 modulo 77 = 65 because

$\boxed{65 \bmod 77 - 12 \bmod 77 = 0.}$ $(65+12) \bmod 77 = 0$

b) The additive inverse of 45 modulo 8 = 5 because

$45 \bmod 8 - 5 \bmod 8 = 0$ $\quad \cancel{-5 \bmod 8} = 3$

Also: $(45+3) \bmod 8 = 0$

5. a) The multiplicative inverse of 11 mod 26 exists if the greatest common factor of 26 and 11 is 1.

In other words $1 = (m \cdot 11) \bmod 26$

$$\begin{bmatrix}26\\1\\0\end{bmatrix} - 2 \cdot \begin{bmatrix}11\\0\\1\end{bmatrix} = \begin{bmatrix}15\\1\\-1\end{bmatrix} \begin{bmatrix}4\\1\\-2\end{bmatrix}$$

$$\begin{bmatrix}11\\0\\1\end{bmatrix} - 0 \begin{bmatrix}15\\1\\-1\end{bmatrix} = \begin{bmatrix}11\\0\\1\end{bmatrix} \quad \begin{bmatrix}11\\0\\1\end{bmatrix} - 2 \cdot \begin{bmatrix}4\\1\\-2\end{bmatrix} = \ldots$$

$45 \bmod 8 = 5$

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Assessment 1 (cont.)

5.(a) Continued

$$\begin{bmatrix} 15 \\ 4 \\ -1 \end{bmatrix} - 1 \begin{bmatrix} 11 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 4 \\ 1 \\ -2 \end{bmatrix} \checkmark$$

$$\begin{bmatrix} 11 \\ 0 \\ 1 \end{bmatrix} - 2 \begin{bmatrix} 4 \\ 1 \\ -2 \end{bmatrix} = \begin{bmatrix} 3 \\ -2 \\ 5 \end{bmatrix} \checkmark$$

$$\begin{bmatrix} 4 \\ 1 \\ -2 \end{bmatrix} - 1 \begin{bmatrix} 3 \\ -2 \\ 5 \end{bmatrix} = \begin{bmatrix} 1 \\ 3 \\ -7 \end{bmatrix} \Rightarrow 1 = 3.26 + (-7).11$$

$-7 \bmod 26 = 19$

$$\begin{bmatrix} 3 \\ -2 \\ 5 \end{bmatrix} - 3 \begin{bmatrix} 1 \\ 3 \\ -7 \end{bmatrix} = \begin{bmatrix} 0 \\ -11 \\ 26 \end{bmatrix}$$

Because we found the additive inverse of the original matrix operation, the multiplicative inverse does exist. The multiplicative inverse of 11 mod 26 = -7.

What about the mult. inv. of 11 modulo 22?

6. c) $(37.25)_8$ to binary ⇒ each octal is three binary digits

0b 011 111 010 101 ✓

f) 0xA3C2 to decimal ⇒ each hex is 4 binary

$\Rightarrow \boxed{10.16^3 + 3.16^2 + 12.16^1 + 2.16^0}$

$\Rightarrow 10.4096 + 768 + 192 + 2$

$\Rightarrow 50\,58$

6. d) 3725 to decimal

$\Rightarrow 3 \cdot 8^3 + 7 \cdot 8^2 + 2 \cdot 8^1 + 5 \cdot 8^0$

$\Rightarrow$ 2005 ✓

g) 0xABC2 to binary $\Rightarrow$ 1 hex digit = 4 binary digits

0b 1010 0011 1100 0010 ✓

9. a) R E S T R
S L E E P
$\Rightarrow$ J P W X G ✓

b) R E S T R E S T R E
I E D T O E L B F R
$\Rightarrow$ RELAXATION ✓

Write across rows, transpose, then read down columns.

8a.

J	U	N	G	I	E
K	P	L	N	I	R
E	C	M	D	P	O
E	A	A	C	E	~~H~~

E	G	J	L	N	U
R	N	K	I	L	P
O	D	E	P	M	C
N	C	E	E	A	A

Encoded message: RONNDCKEEIPELMAPCA

b)

E	G	I	L	N	U
C	A	S	I	O	M
D	E	E	G	E	
Y	S	A	U	O	
S	N	I	E	R	L
T	F	S	V	E	
R	O	N	R	A	
		N		L	