MA111-011 Exam 2 Name: Practice

1. For each number and modulus give 5 other numbers equivalent to it.
At least one must be negative. At least one must be larger than 100.

(a) $7 \pmod 5$ (b) $7 \pmod{10}$

(c) $30 \pmod{21}$ (d) $18 \pmod{26}$

(e) Explain in your own words how you get answers to this problem.

2. For each number problem give the **standard representative** of the answer.

(a) $105 \pmod{10}$ (b) $40 \pmod{37}$

(c) $78 \pmod{10}$ (d) $375 \pmod{37}$

(e) Explain in your own words how you get answers to this problem.

3. For each arithmetic problem give the **standard representative** of the answer.

(a) $105 + 78 \pmod{10}$ (b) $40 + 375 \pmod{37}$

(c) $105 - 78 \pmod{10}$ (d) $40 - 375 \pmod{37}$

(e) $105 \times 78 \pmod{10}$ (f) $40 \times 375 \pmod{37}$

(g) Explain in your own words how you get answers to this problem.

4. For each division problem give the **standard representatives** of all of the answers. If there are no answers, mention that, for example "there are no solutions." The shorthand $7 \div 5 \pmod{13}$ means the standard representatives of all numbers (like 4) that when multiplied by 5 give 7 as the result, at least mod 13 ($4 \times 5 = 20 \equiv 7 \pmod{13}$ so 4 works. No other numbers work, since 5 is a unit mod 13). Sometimes we wrote $7 \div 5 \pmod{13}$ as $\frac{7}{5} \pmod{13}$.

(a) $7 \div 2 \pmod{13}$

(b) $7 \div 10 \pmod{13}$

(c) $15 \div 20 \pmod{13}$

(d) $-14 \div 10 \pmod{17}$

(e) Explain in your own words how you get answers to this problem

5. For each number and modulus classify it as a unit, zero, or zero divisor. Explain why.

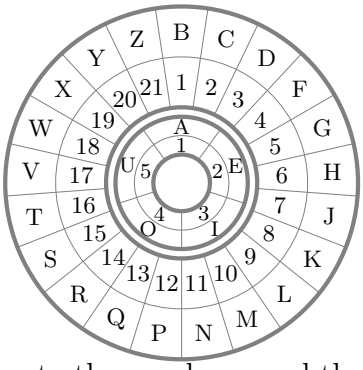
(a) $3 \pmod{21}$

$2 \pmod{5}$

6. For each letter give 5 numbers equivalent to it. At least one must be negative. At least one must be larger than 100.

E

L



7. Label each letter with its number. Apply the shift by 12 cipher to the numbers, and then write down the corresponding letter. In other words, show your work for a shift encryption.

`H o m e w o r k`

8. Label each letter with its number. Decrypt the shift by 12 cipher, first on the numbers, and then write down the corresponding letters. The result should be an encouraging word.

I L O H A B O

9. What shift key was used to encrypt the word `secret` to the nonsense-word NOXMOP ?

10. Copy the original numbers from #7, and encrypt them with the multiply by 4 cipher, then write down the corresponding letters.

11. The following words were encrypted with the multiply by 4 cipher. Write down their numbers, divide them by 4, and write down the corresponding letter. The result should be an encouraging word.

TOFUSAUW

12. Decrypt the following message. Show all work. If you are having trouble showing work, then write down some things you can tell about the message.

Hint: One of the words is "the"

OBU JEI DRU CYJ A OW VEETAXQ PEB?