Name: _____

Let the UNCODED alphabet be assigned numerical values as follows.

| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |

Crack the following codes. Each code can be solved using linguistic methods (and this is how you should approach it), but there will also be a mathematical formula or rule that determines how you compute the UNCODED number into its ENCODED number. This will necessarily be a one-to-one and onto function from {1,…,26} to {1,…,26}. If we let X=uncoded number, and Y=encoded number, then the RULE (for this problem set) will be of the form Y=mX+b (mod 26). The (mod 26) simply means that if we go higher than 26, we "wrap around". So 27 =1, 28=2, 29=3…

For code#1 and code#2, the RULE/FORMULA is reasonably simple. For code#3, because the message is longer, it is actually easier to figure out using linguistic methods. (Note: the ___ means space and the commas are there to separate the numbers.) But, the formula for the rule is a little harder to figure out, so it's optional (but if you do it you get extra credit). For code#4 (which is optional but if you do it you get extra credit), you don't have the spaces to help you like you do in code#3, but you can still solve it using linguistic methods. And if you can figure out the formula, then even more extra credit points. GOOD LUCK!

## Code #1

20-21-06-17-09-06-15   12-10-15-08

02-08-02-21-09-02    04-09-19-10-20-21-10-06

11-16-09-15    08-19-10-20-09-02-14

04-09-02-19-13-06-20    05-10-04-12-06-15-20

08-06-16-19-08-06   16-19-24-06-13-13

When you think you have figured out what letter each number corresponds to, please write it in the following table:

| 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

*You should see a "visual" pattern here.

RULE/FORMULA: (Recall, it should be of the form: Y=mX+b (mod 26), with X the uncoded number and Y the encoded number.)

**<u>Code #2</u>**

10-6-22-22-13

8-18-14-11-15-2    9-22-23

25-12-13-17-12-5-18

20-22-13-22-8-18-8

8-18-14-11-15-22   14-18-13-23-8

When you think you have figured out what letter each number corresponds to, please write it in the following table:

| 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

*You should see a "visual" pattern here.

RULE/FORMULA: (Recall, it should be of the form: Y=mX+b (mod 26), with X the uncoded number and Y the encoded number.)

11, __ 14, 25, 24, 05, __ 24, 03, __ 19, 11, 02, 02, 05, 18, __ 20, 03, 17, __ 23, 20, 03, 18, 02, __

25, 23, __ 19, 11, 26, 05, __ 07, 08, __ 03, 10, __ 11, 24, __ 25, 24, 10, 25, 24, 25, 02, 05, __ 24,

07, 19, 16, 05, 18, __ 03, 10, __ 08, 03, 25, 24, 02, 23, __ 11, __ 08, 14, 11, 24, 05, __ 24, 03, __

19, 11, 02, 02, 05, 18, __ 25, 02, 23, __ 23, 25, 06, 05, __ 25, 23, __ 19, 11, 26, 05, __ 07, 08, __

03, 10, __ 11, 24, __ 25, 24, 10, 25, 24, 25, 02, 05, __ 24, 07, 19, 16, 05, 18, __ 03, 10, __ 14,

25, 24, 05, 23, __ 11, __ 12, 03, 14, 07, 19, 05, __ 03, 10, __ 11, 24, __ 25, 24, 10, 25, 24, 25,

02, 05, __ 24, 07, 19, 16, 05, 18, __ 03, 10, __ 08, 14, 11, 24, 05, 23, __ 20, 01, 08, 05, 18, 23,

08, 11, 21, 05, __ 02, 20, 11, 02, __ 25, 23, __ 10, 03, 07, 18, __ 26, 25, 19, 05, 24, 23, 25, 03,

24, 11, 14, __ 15, 05, 03, 19, 05, 02, 18, 01, __ 23, 02, 07, 26, 25, 05, 23, __ 20, 01, 08, 05, 18,

12, 03, 14, 07, 19, 05, 23, __ 11, __ 20, 01, 08, 05, 18, 23, 08, 20, 05, 18, 05, __ 25, 23, __ 19,

11, 26, 05, __ 07, 08, __ 03, 10, __ 11, 24, __ 25, 24, 10, 25, 24, 25, 02, 05, __ 24, 07, 19, 16,

05, 18, __ 03, 10, __ 23, 08, 20, 05, 18, 05, 23, __ 11, __ 20, 01, 08, 05, 18, 21, 07, 16, 05, __

03, 10, __ 11, 24, __ 25, 24, 10, 25, 24, 25, 02, 05, __ 24, 07, 19, 16, 05, 18, __ 03, 10, __ 21,

07, 16, 05, 23, __ 17, 05, __ 26, 03, __ 24, 03, 02, __ 09, 24, 03, 17, __ 25, 10, __ 02, 20, 05, 23,

05, __ 11, 21, 02, 07, 11, 14, 14, 01, __ 05, 22, 25, 23, 02, __ 01, 05, 02, __ 17, 05, __ 07, 24,

26, 05, 18, 23, 02, 11, 24, 26, __ 02, 20, 05, 25, 18, __ 14, 11, 17, 23,

When you think you have figured out what letter each number corresponds to, please write it in the following table:

| 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

*This will "appear" to be a little more random.

**(BONUS):** RULE/FORMULA: (Recall, it should be of the form: Y=mX+b (mod 26), with X the uncoded number and Y the encoded number.)

## Code #4 (OPTIONAL):

25, 23, 09, 13, 17, 26, 09, 23, 18, 05, 24, 05, 02, 05, 17, 06, 03, 10, 02, 05,

06, 26, 03, 16, 06, 26, 07, 25, 04, 18, 23, 02, 23, 19, 13, 05, 03, 18, 05, 06,

26, 05, 04, 03, 19, 05, 25, 07, 16, 06, 26, 07, 25, 10, 23, 23, 21, 07, 07, 16,

20, 07, 06, 05, 06, 26, 05, 18, 05, 03, 24, 05, 18, 06, 23, 04, 05, 18, 13, 25,

05, 06, 26, 05, 09, 03, 16, 24, 06, 23, 03, 24, 09, 07, 18, 05, 06, 26, 05, 25,

06, 18, 03, 16, 19, 05, 24, 18, 03, 01, 07, 16, 19, 25, 25, 13, 18, 04, 18, 07,

25, 05, 25, 03, 10, 23, 13, 16, 24, 12, 23, 18, 05, 08, 03, 09, 04, 02, 05, 06,

26, 05, 06, 23, 04, 23, 02, 23, 19, 07, 17, 03, 02, 07, 25, 02, 03, 16, 24, 25,

07, 16, 17, 26, 03, 04, 06, 05, 18, 05, 07, 19, 26, 06, 12, 23, 18, 05, 08, 03,

09, 04, 02, 05, 06, 26, 05, 09, 23, 10, 07, 13, 25, 25, 06, 18, 07, 04, 06, 26,

03, 06, 03, 16, 15, 23, 16, 05, 17, 03, 16, 17, 23, 16, 25, 06, 18, 13, 17, 06,

01, 07, 06, 26, 03, 25, 26, 05, 05, 06, 23, 12, 04, 03, 04, 05, 18, 03, 16, 24,

25, 17, 07, 25, 25, 23, 18, 25, 03, 16, 24, 07, 25, 03, 16, 07, 16, 17, 18, 05,

24, 07, 10, 02, 05, 25, 13, 18, 12, 03, 17, 05, 01, 07, 06, 26, 23, 16, 02, 15,

23, 16, 05, 25, 07, 24, 05,

When you think you have figured out what letter each number corresponds to, please write it in the following table:

| 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

*This will "appear" to be a little more random.

**(BONUS):** RULE/FORMULA: (Recall, it should be of the form: Y=mX+b (mod 26), with X the uncoded number and Y the encoded number.)