7.5.1: Application of Matrices in Cryptography (Exercises)

SECTION 7.5 PROBLEM SET: APPLICATION OF MATRICES IN CRYPTOGRAPHY

In problems 1 - 8, the letters A to Z correspond to the numbers 1 to 26, as shown below, and a space is represented by the number 27.

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

In problems 1 - 2, use the matrix A, given below, to encode the given messages.

$$A = \begin{bmatrix} 3 & 2 \\ 1 & 1 \end{bmatrix}$$

In problems 3 - 4, decode the messages that were encoded using matrix A.
Make sure to consider the spaces between words, but ignore all punctuation. Add a final space if necessary.

1. Encode the message: WATCH OUT!	2. Encode the message: HELP IS ON THE WAY.
3. Decode the following message: 64 23 102 41 82 32 97 35 71 28 69 32	4. Decode the following message: 105 40 117 48 39 19 69 32 72 27 37 15 114 47

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In problems 5 - 6, use the matrix B, given below, to encode the given messages.

$$\mathrm{B} = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 2 \\ 1 & 0 & -1 \end{bmatrix}$$

In problems 7 - 8, decode the messages that were encoded using matrix B.

Make sure to consider the spaces between words, but ignore all punctuation. Add a final space if necessary.

5. Encode the message using matrix B: LUCK IS ON YOUR SIDE.	6. Encode the message using matrix B: MAY THE FORCE BE WITH YOU.
7. Decode the following message that was encoded using matrix B: 8 23 7 4 47 - 2 15 102 -12 20 58 15 27 80 18 12 74 -7	8. Decode the following message that was encoded using matrix B: 12 69 - 3 11 53 9 5 46 -10 18 95 - 9 25 107 4 27 76 22 1 72 -26