

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

Write the uncoded row matrices 1×3 for the message **MEET ME MONDAY**

$$\begin{array}{ccccccccccccccc}
 M & E & E & T & _ & M & E & _ & M & O & N & D & A & Y & _ \\
 [13 & 5 & 5] & [20 & 0 & 13] & [5 & 0 & 13] & [15 & 14 & 4] & [1 & 25 & 0]
 \end{array}$$

Let use an invertible matrix

$$A = \begin{pmatrix} 1 & -2 & 2 \\ -1 & 1 & 3 \\ 1 & -1 & -4 \end{pmatrix}$$

Let encode the message **MEET ME MONDAY**

$$[13 \ 5 \ 5] \begin{bmatrix} 1 & -2 & 2 \\ -1 & 1 & 3 \\ 1 & -1 & -4 \end{bmatrix} = [13 \ -26 \ 21]$$

$$[20 \ 0 \ 13] \begin{bmatrix} 1 & -2 & 2 \\ -1 & 1 & 3 \\ 1 & -1 & -4 \end{bmatrix} = [33 \ -53 \ -12]$$

$$[5 \ 0 \ 13] \begin{bmatrix} 1 & -2 & 2 \\ -1 & 1 & 3 \\ 1 & -1 & -4 \end{bmatrix} = [18 \ -23 \ -42]$$

$$[15 \ 14 \ 4] \begin{bmatrix} 1 & -2 & 2 \\ -1 & 1 & 3 \\ 1 & -1 & -4 \end{bmatrix} = [5 \ -20 \ 56]$$

$$[1 \ 25 \ 0] \begin{bmatrix} 1 & -2 & 2 \\ -1 & 1 & 3 \\ 1 & -1 & -4 \end{bmatrix} = [-24 \ 23 \ 77]$$

The cryptogram: 13 -26 -21 33 -53 -12 18 -23 -42 5 -20 56 -24 23 77

To decode a message given the matrix

$$A = \begin{pmatrix} 1 & -2 & 2 \\ -1 & 1 & 3 \\ 1 & -1 & -4 \end{pmatrix}$$

With the cryptogram:

$$13 \quad -26 \quad -21 \quad 33 \quad -53 \quad -12 \quad 18 \quad -23 \quad -42 \quad 5 \quad -20 \quad 56 \quad -24 \quad 23 \quad 77$$

$$\begin{bmatrix} 13 & -26 & -21 \end{bmatrix} \quad \begin{bmatrix} 33 & -53 & -12 \end{bmatrix} \quad \begin{bmatrix} 18 & -23 & -42 \end{bmatrix} \quad \begin{bmatrix} 5 & -20 & 56 \end{bmatrix} \quad \begin{bmatrix} -24 & 23 & 77 \end{bmatrix}$$

$$A^{-1} = \begin{bmatrix} -1 & -10 & -8 \\ -1 & -6 & -5 \\ 0 & -1 & -1 \end{bmatrix}$$

$$\begin{bmatrix} 13 & -26 & -21 \end{bmatrix} \begin{bmatrix} -1 & -10 & -8 \\ -1 & -6 & -5 \\ 0 & -1 & -1 \end{bmatrix} = \begin{bmatrix} 13 & 5 & 5 \end{bmatrix}$$

$$\begin{bmatrix} 33 & -53 & -12 \end{bmatrix} \begin{bmatrix} -1 & -10 & -8 \\ -1 & -6 & -5 \\ 0 & -1 & -1 \end{bmatrix} = \begin{bmatrix} 20 & 0 & 13 \end{bmatrix}$$

$$\begin{bmatrix} 18 & -23 & -42 \end{bmatrix} \begin{bmatrix} -1 & -10 & -8 \\ -1 & -6 & -5 \\ 0 & -1 & -1 \end{bmatrix} = \begin{bmatrix} 5 & 0 & 13 \end{bmatrix}$$

$$\begin{bmatrix} 5 & -20 & 56 \end{bmatrix} \begin{bmatrix} -1 & -10 & -8 \\ -1 & -6 & -5 \\ 0 & -1 & -1 \end{bmatrix} = \begin{bmatrix} 15 & 14 & 4 \end{bmatrix}$$

$$\begin{bmatrix} -24 & 23 & 77 \end{bmatrix} \begin{bmatrix} -1 & -10 & -8 \\ -1 & -6 & -5 \\ 0 & -1 & -1 \end{bmatrix} = \begin{bmatrix} 1 & 25 & 0 \end{bmatrix}$$

$$13 \quad 5 \quad 5 \quad 20 \quad 0 \quad 13 \quad 5 \quad 0 \quad 13 \quad 15 \quad 14 \quad 4 \quad 1 \quad 25 \quad 0$$

M E E T _ M E _ M O N D A Y _