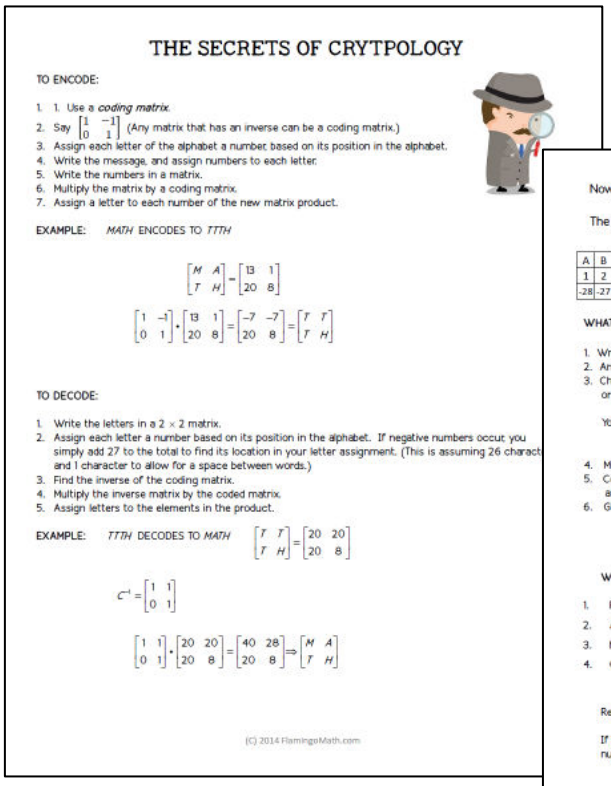
Cryptology

Secret Codes & Matrices



Product Pages



THE SECRETS OF CRYTPOLOGY

TO ENCODE:

1. 1. Use a *coding matrix*.
2. Say $\begin{bmatrix}1 & -1\\0 & 1\end{bmatrix}$ (Any matrix that has an inverse can be a coding matrix.)
3. Assign each letter of the alphabet a number based on its position in the alphabet.
4. Write the message, and assign numbers to each letter.
5. Write the numbers in a matrix.
6. Multiply the matrix by a coding matrix.
7. Assign a letter to each number of the new matrix product.

EXAMPLE: *MATH* ENCODES TO *TTTH*

$$\begin{bmatrix}M & A\\T & H\end{bmatrix}=\begin{bmatrix}13 & 1\\20 & 8\end{bmatrix}$$

$$\begin{bmatrix}1 & -1\\0 & 1\end{bmatrix}\cdot\begin{bmatrix}13 & 1\\20 & 8\end{bmatrix}=\begin{bmatrix}-7 & -7\\20 & 8\end{bmatrix}=\begin{bmatrix}T & T\\T & H\end{bmatrix}$$

TO DECODE:

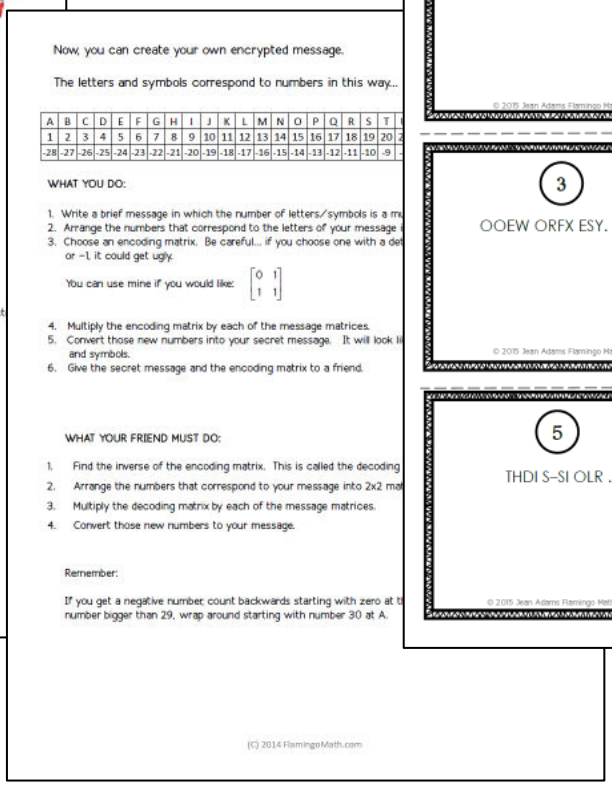
1. Write the letters in a 2×2 matrix.
2. Assign each letter a number based on its position in the alphabet. If negative numbers occur, you simply add 27 to the total to find its location in your letter assignment. (This is assuming 26 characters and 1 character to allow for a space between words.)
3. Find the inverse of the coding matrix.
4. Multiply the inverse matrix by the coded matrix.
5. Assign letters to the elements in the product.

EXAMPLE: *TTTH* DECODES TO *MATH* $\begin{bmatrix}T & T\\T & H\end{bmatrix}=\begin{bmatrix}20 & 20\\20 & 8\end{bmatrix}$

$$C^{-1}=\begin{bmatrix}1 & 1\\0 & 1\end{bmatrix}$$

$$\begin{bmatrix}1 & 1\\0 & 1\end{bmatrix}\cdot\begin{bmatrix}20 & 20\\20 & 8\end{bmatrix}=\begin{bmatrix}40 & 28\\20 & 8\end{bmatrix}\Rightarrow\begin{bmatrix}M & A\\T & H\end{bmatrix}$$

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Now, you can create your own encrypted message.

The letters and symbols correspond to numbers in this way...

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
-28	-27	-26	-25	-24	-23	-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9

WHAT YOU DO:

1. Write a brief message in which the number of letters/symbols is a m
2. Arrange the numbers that correspond to the letters of your message
3. Choose an encoding matrix. Be careful... if you choose one with a de or −1, it could get ugly.

   You can use mine if you would like: $\begin{bmatrix}0 & 1\\1 & 1\end{bmatrix}$
4. Multiply the encoding matrix by each of the message matrices.
5. Convert those new numbers into your secret message. It will look li and symbols.
6. Give the secret message and the encoding matrix to a friend.

WHAT YOUR FRIEND MUST DO:

1. Find the inverse of the encoding matrix. This is called the decoding
2. Arrange the numbers that correspond to your message into 2x2 mat
3. Multiply the decoding matrix by each of the message matrices.
4. Convert those new numbers to your message.

Remember:

If you get a negative number, count backwards starting with zero at t number bigger than 29, wrap around starting with number 30 at A.

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1
THDI S–SI VEET
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2
EAUJ SQHV REJF
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3
OOEW ORFX ESY. RSIT
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4
T–.E MECT ATAD RCZH EINY
© 2015 Jean Adams Flamingo Math™

5
THDI S–SI OLR .
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6
T–FU –IOO ASEX
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7
ENNR TIKR –AET –TRY EIWT
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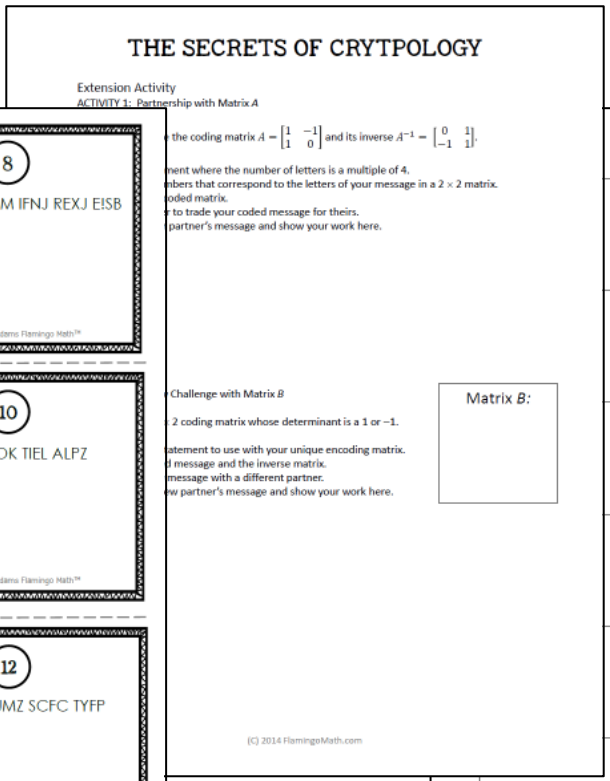
8
KEXF OSPF IVRM IFNJ REXJ E!SB
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9
THDI S–SI TI IJ ALPZ
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10
THDI FUOK TIEL ALPZ
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11
NDDI NE .T OWKH
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12
AMCR –UMZ SCFC TYFP
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THE SECRETS OF CRYTPOLOGY

Extension Activity

ACTIVITY 1: Partnership with Matrix *A*

the coding matrix $A=\begin{bmatrix}1 & -1\\1 & 0\end{bmatrix}$ and its inverse $A^{-1}=\begin{bmatrix}0 & 1\\-1 & 1\end{bmatrix}$.

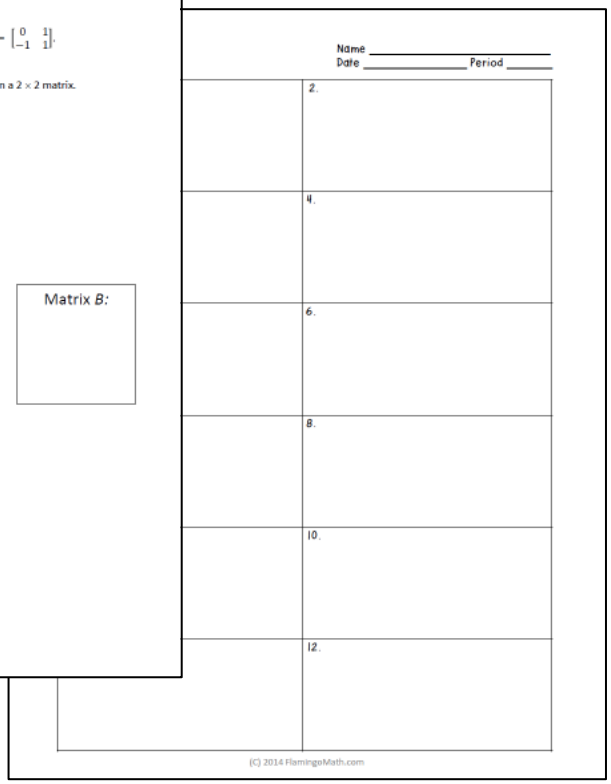
ment where the number of letters is a multiple of 4.
mbers that correspond to the letters of your message in a 2×2 matrix.
oded matrix.
to trade your coded message for theirs.
partner's message and show your work here.

Challenge with Matrix *B*

2 coding matrix whose determinant is a 1 or −1.
atement to use with your unique encoding matrix.
d message and the inverse matrix.
message with a different partner.
w partner's message and show your work here.

Matrix *B:*

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Name _____

Date _____ Period _____

2.

4.

6.

8.

10.

12.

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