UNIT Matrices
LT I can perform matrix operations.
HOWL Responsibility
CV Integrity

Task
Matrix Cryptography

OBJECTIVE To demonstrate and explain how encryption and decryption of messages work using matrix multiplication and inverses

ACADEMIC MASTERY To receive the highest score possible, your piece should contain the following elements:
- All the steps of a plaintext being encoded using a matrix key and then decoded using its inverse
  - multiplying matrices
  - finding the determinant of a 2 x 2 matrix
  - finding the inverse of a 2 x 2 matrix
- Detailed explanation of the matrix properties used in the encryption and decryption process
- Vocabulary words specific to cryptography and matrices, including but not limited to:
  - alphabet, cipher, ciphertext, clear text, code, cracking, cryptography, deciphering, decrypting, enciphering, encrypted message, encryption, key, password, plaintext
  - array, column, commutative, determinant, diagonal, identity, inverse, matrix, non-singular, row, singular, size, square
- Example of how the encryption and decryption process changes when the same (or very similar code) is constructed as a differently-sized matrix
  - all steps are clearly shown
  - steps are still worked out for the determinant, but the use of a calculator is allowed to find the inverse if the matrix key is larger than 2 x 2
  - detailed explanation focuses on how the math is different than the previous code

CRAFTSMANSHIP To receive the highest score possible, your piece should contain the following elements:
- A code that contains at least 18 characters
- A code that includes spaces and punctuation
- A character-and-number bank that is not simply A=1, B=2, C=3...
- Visuals, such as colors and pictures, appropriate to your format
- Rough draft of math work and explanations
- A final presentation that is easy to understand, organized, and engaging

FORMAT Be creative. Think beyond simply writing a problem and response. The following formats are encouraged but not limited to:
- How-to guide in the form of a book, pamphlet, or poster
- Themed story
- PowerPoint slideshow or Prezi
- Video
<table>
<thead>
<tr>
<th>Rubric</th>
<th>Math</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
</table>
| **Matrix Operations** | - The following matrix operations are performed correctly with no conceptual errors:  
  - multiplying matrices  
  - finding the determinant of a matrix  
  - finding the inverse of a matrix | - Work contains no conceptual errors and minimal computation errors. | - Work may contain conceptual errors and has several computation errors. | - Work is mostly incorrect, with many conceptual and computation errors. | |
| **Explanations** | - Explanations outline all steps in matrix encryption process.  
  - Explanations correctly define all matrix properties.  
  - Many vocabulary words are present.  
  - All language is easy to understand. | - Explanations outline most steps in matrix encryption process.  
  - Explanations correctly define most matrix properties.  
  - Some vocabulary words are present.  
  - Most language is easy to understand. | - Explanations outline some steps in matrix encryption process.  
  - Explanations correctly define some matrix properties.  
  - Few vocabulary words are present.  
  - Some language is easy to understand. | - Explanations outline very few steps in matrix encryption process.  
  - Explanations correctly define very few matrix properties.  
  - No vocabulary words are present.  
  - Language is very difficult to understand or incomprehensible. | |

<table>
<thead>
<tr>
<th>Rubric</th>
<th>HOWLs</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
</table>
| **Responsibility** | I met the criteria for '4' and:  
  - I strategically use resources to meet my goals.  
  - I strategically plan my time inside and outside of class. | I consistently have my materials organized for every class.  
  - I consistently complete work on time and meet every major deadline. | I often have my materials.  
  - I often complete work on time and meet most major deadlines. | I rarely have my materials.  
  - I rarely complete work on time and meet some major deadlines. | |
| **Craftsmanship** | I met the criteria for '4' and:  
  - I reflect on my own progress toward meeting professional standards.  
  - I seek out additional feedback and use it to improve my work until it meets professional standards.  
  - All criteria are met on the previous page. | I consistently reflect on my work using learning targets and/or exemplars.  
  - I consistently use feedback to revise my work until it meets or exceeds expectations.  
  - Most of the criteria is met on the previous page. | I often reflect on my work using learning targets and/or exemplars.  
  - I often use feedback to revise my work.  
  - Some of the criteria are met on the previous page. | I rarely reflect on my work before submitting it.  
  - I rarely use feedback to revise my work.  
  - Few of the criteria are met on the previous page. | |