Implementing the Caesar Cipher

Developing an Algorithm

Duke
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Step 1: Work an Example

- Step 1: Work a small example

Message	`I AM`
Key	`17`

Alphabet	`ABCDEFGHIJKLMNOPQRSTUVWXYZ`
Shifted Alphabet	`RSTUVWXYZABCDEFGHIJKLMNOPQ`

Step 1: Work an Example

- Step 1: Work a small example

Message	Z RD
Key	17

Alphabet	ABCDEFGHIJKLMNOPQRSTUVWXYZ
Shifted Alphabet	RSTUVWXYZABCDEFGHIJKLMNOPQ

Step 2: Write Down What You Did

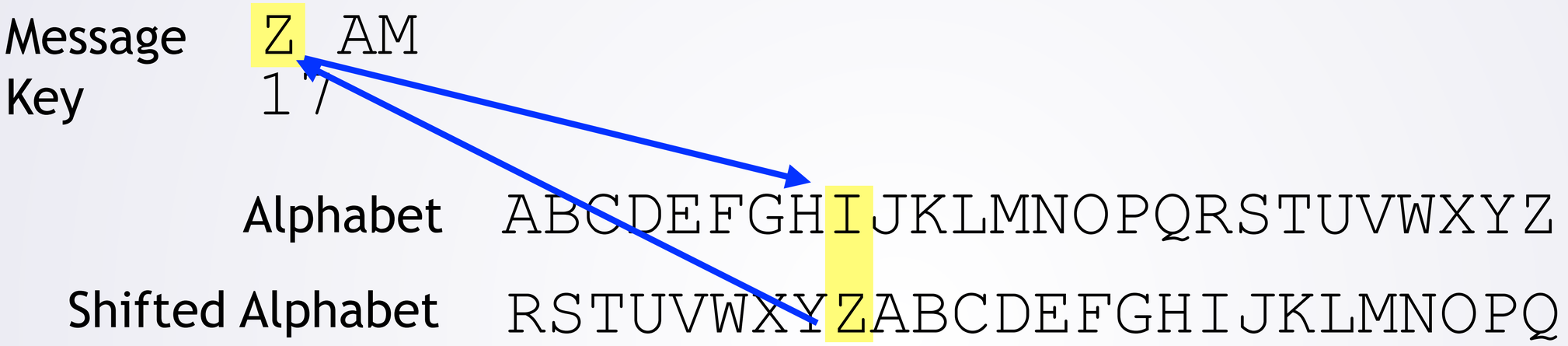
Message `I AM`
Key `17`

Alphabet `ABCDEFGHIJKLMNOPQRSTUVWXYZ`

Shifted Alphabet `RSTUVWXYZABCDEFGHIJKLMNOPQ`

1. **Wrote down the alphabet**
2. **Computed the shifted alphabet**

Step 2: Write Down What You Did



3. **Looked at 0th letter of message (‘I’)**
4. **Looked for ‘I’ in alphabet**
5. **Found letter in same position in shifted alphabet (‘Z’)**
6. **Replaced the 0th character of the message with ‘Z’**

Step 2: Write Down What You Did

Message Z AM
Key 17

Alphabet ABCDEFGHIJKLMNOPQRSTUVWXYZ

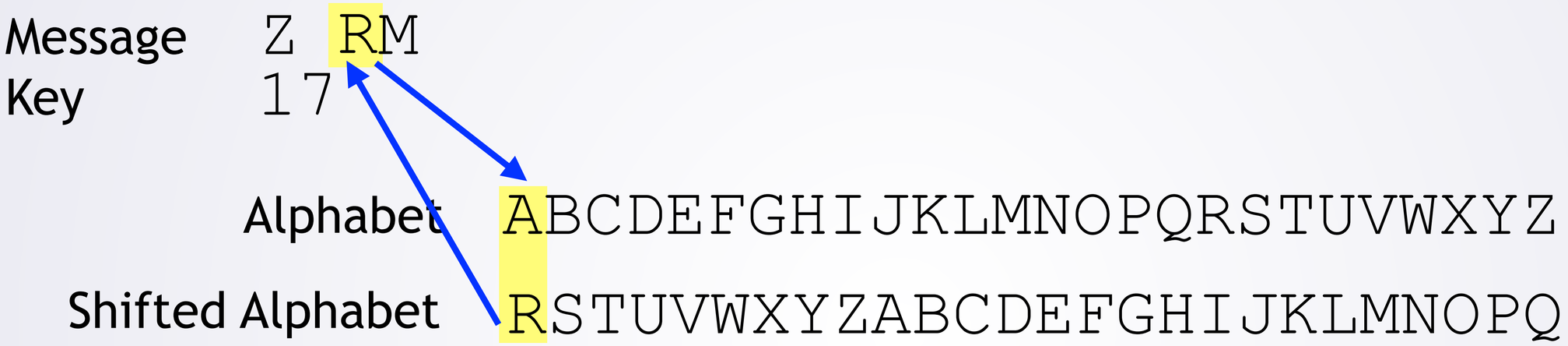
Shifted Alphabet RSTUVWXYZABCDEFGHIJKLMNOPQ

7 **Looked at 1st letter of message (‘ ’)**

8 **Looked for ‘ ’ in alphabet**

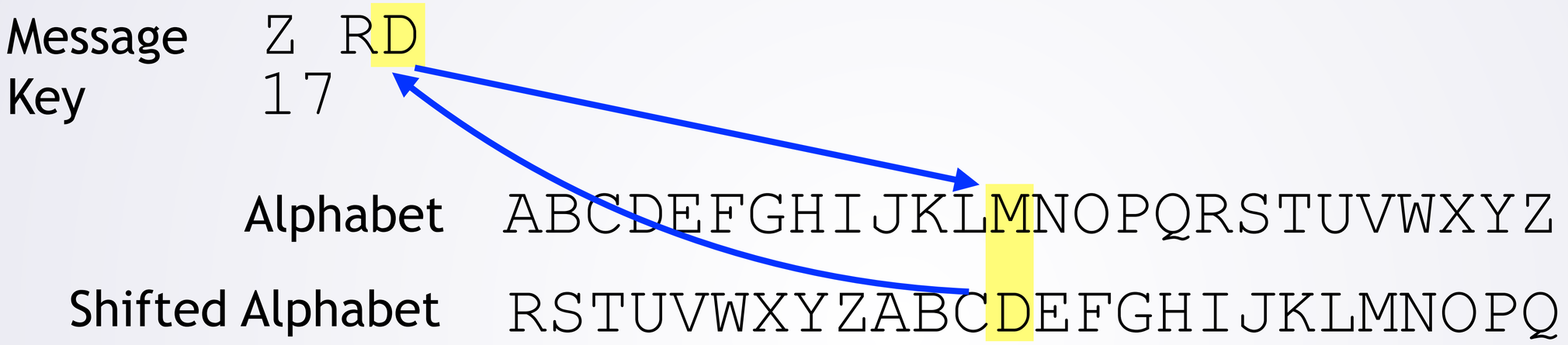
9 **Not found (did not change 1st character)**

Step 2: Write Down What You Did



10. **Looked at 2nd letter of message (‘A’)**
11. **Looked for ‘A’ in alphabet**
12. **Found letter in same position in shifted alphabet (‘R’)**
13. **Replaced the 2nd character of the message with ‘R’**

Step 2: Write Down What You Did



14 **Looked at 3rd letter of message (‘M’)**

15 **Looked for ‘M’ in alphabet**

16 **Found letter in same position in shifted alphabet (‘D’)**

17 **Replaced the 3rd character of the message with ‘D’**

Step 2: Write Down What You Did

1. Wrote down the alphabet
2. Computed the shifted alphabet
3. Looked at 0th letter of message (‘I’)
4. Looked for ‘I’ in alphabet
5. Found letter in same position in shifted alphabet (‘Z’)
6. Replaced the 0th character of the message with ‘Z’
7. Looked at 1st letter of message (‘ ’)
8. Looked for ‘ ’ in alphabet
9. Not found (did not change 1st character)
10. Looked at 2nd letter of message (‘A’)
11. Looked for ‘A’ in alphabet
12. Found letter in same position in shifted alphabet (‘R’)
13. Replaced the 2nd character of the message with ‘R’
14. Looked at 3rd letter of message (‘M’)
15. Looked for ‘M’ in alphabet
16. Found letter in same position in shifted alphabet (‘D’)
17. Replaced the 3rd character of the message with ‘D’

Step 2: Write Down What You Did

0. Make a StringBuilder with message (encrypted)
1. Wrote down the alphabet
2. Computed the shifted alphabet
3. Looked at 0th letter of message (‘I’)
4. Looked for ‘I’ in alphabet
5. Found letter in same position in shifted alphabet (‘Z’)
6. Replaced the 0th character of the message with ‘Z’
7. Looked at 1st letter of message (‘ ’)
8. Looked for ‘ ’ in alphabet
9. Not found (did not change 1st character)
10. Looked at 2nd letter of message (‘A’)
11. Looked for ‘A’ in alphabet
12. Found letter in same position in shifted alphabet (‘R’)
13. Replaced the 2nd character of the message with ‘R’
14. Looked at 3rd letter of message (‘M’)
15. Looked for ‘M’ in alphabet
16. Found letter in same position in shifted alphabet (‘D’)
17. Replaced the 3rd character of the message with ‘D’

Step 2: Write Down What You Did

0. Make a StringBuilder with message (encrypted)
1. Wrote down the alphabet
2. Computed the shifted alphabet
3. Looked at 0th letter of encrypted (‘I’)
4. Looked for ‘I’ in alphabet
5. Found letter in same position in shifted alphabet (‘Z’)
6. Replaced the 0th character of encrypted with ‘Z’
7. Looked at 1st letter of message (‘ ’)
8. Looked for ‘ ’ in alphabet
9. Not found (did not change 1st character)
10. Looked at 2nd letter of encrypted (‘A’)
11. Looked for ‘A’ in alphabet
12. Found letter in same position in shifted alphabet (‘R’)
13. Replaced the 2nd character of encrypted with ‘R’
14. Looked at 3rd letter of encrypted (‘M’)
15. Looked for ‘M’ in alphabet
16. Found letter in same position in shifted alphabet (‘D’)
17. Replaced the 3rd character of encrypted with ‘D’

Step 3: Find Patterns + Generalize

Initial Setup

0. Make a StringBuilder with message (encrypted)
1. Wrote down the alphabet
2. Computed the shifted alphabet
3. Looked at 0th letter of encrypted (‘I’)
4. Looked for ‘I’ in alphabet
5. Found letter in same position in shifted alphabet (‘Z’)
6. Replaced the 0th character of encrypted with ‘Z’
7. Looked at 1st letter of message (‘ ’)
8. Looked for ‘ ’ in alphabet
9. Not found (did not change 1st character)
10. Looked at 2nd letter of encrypted (‘A’)
11. Looked for ‘A’ in alphabet
12. Found letter in same position in shifted alphabet (‘R’)
13. Replaced the 2nd character of encrypted with ‘R’
14. Looked at 3rd letter of encrypted (‘M’)
15. Looked for ‘M’ in alphabet
16. Found letter in same position in shifted alphabet (‘D’)
17. Replaced the 3rd character of encrypted with ‘D’

Step 3: Find Patterns + Generalize

3. Looked at 0th letter of encrypted (‘I’)
4. Looked for ‘I’ in alphabet
5. Found letter in same position in shifted alphabet (‘Z’)
6. Replaced the 0th character of encrypted with ‘Z’
7. Looked at 1st letter of message (‘ ’)
8. Looked for ‘ ’ in alphabet
9. Not found (did not change 1st character)
10. Looked at 2nd letter of encrypted (‘A’)
11. Looked for ‘A’ in alphabet
12. Found letter in same position in shifted alphabet (‘R’)
13. Replaced the 2nd character of encrypted with ‘R’
14. Looked at 3rd letter of encrypted (‘M’)
15. Looked for ‘M’ in alphabet
16. Found letter in same position in shifted alphabet (‘D’)
17. Replaced the 3rd character of encrypted with ‘D’

Step 3: Find Patterns + Generalize

3. Looked at 0th letter of encrypted (‘I’)
4. Looked for ‘I’ in alphabet
5. Found letter in same position in shifted alphabet (‘Z’)
6. Replaced the 0th character of encrypted with ‘Z’
7. Looked at 1st letter of message (‘ ’)
8. Looked for ‘ ’ in alphabet
9. Not found (did not change 1st character)
10. Looked at 2nd letter of encrypted (‘A’)
11. Looked for ‘A’ in alphabet
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13. Replaced the 2nd character of encrypted with ‘R’
14. Looked at 3rd letter of encrypted (‘M’)
15. Looked for ‘M’ in alphabet
16. Found letter in same position in shifted alphabet (‘D’)
17. Replaced the 3rd character of encrypted with ‘D’

Step 3: Find Patterns + Generalize

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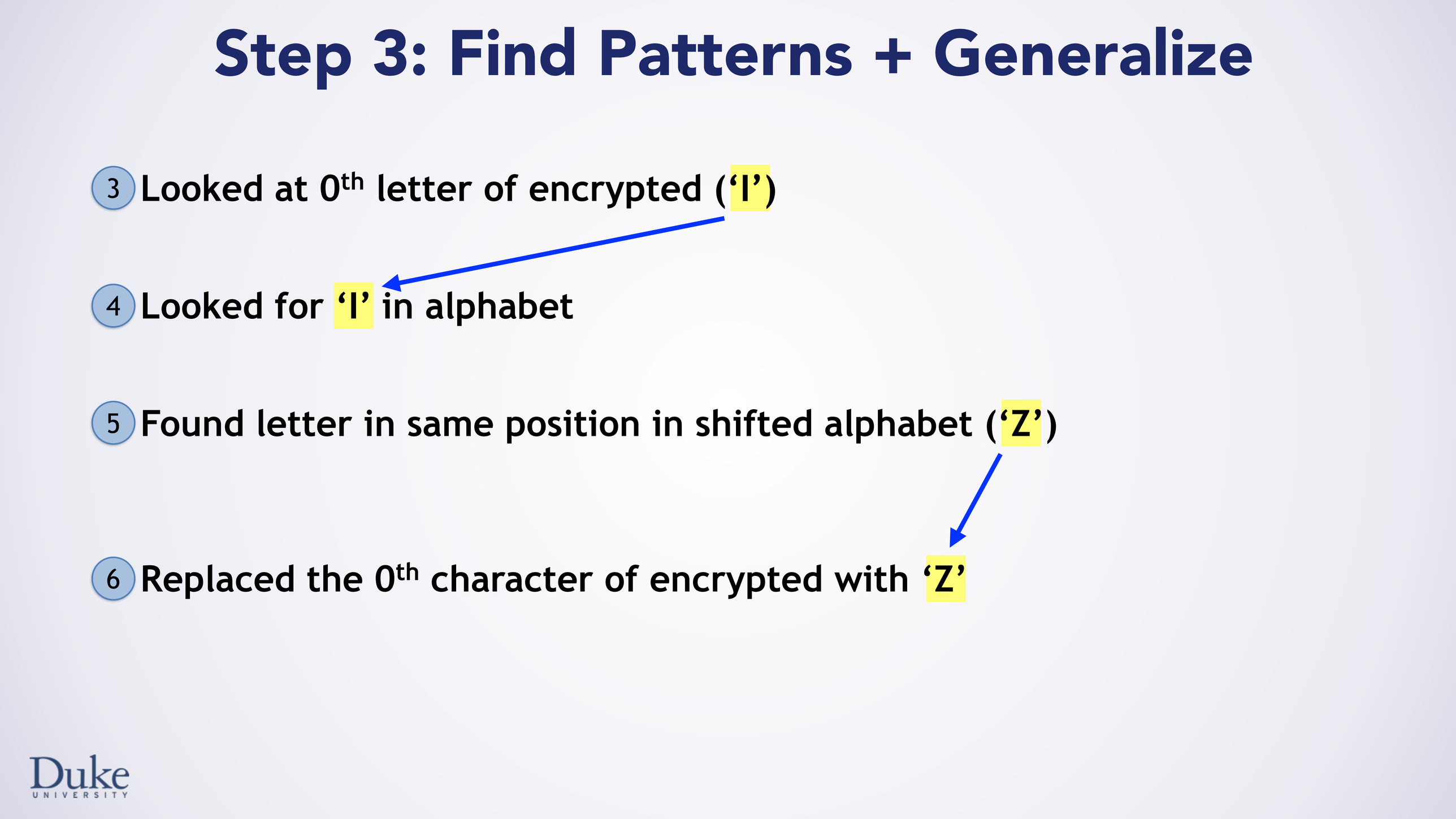
6. Replaced the 0th character of encrypted with ‘Z’



Step 3: Find Patterns + Generalize

0. Make a StringBuilder with message (encrypted)
1. Write down the alphabet
2. Compute the shifted alphabet
3. Count from 0 to <= 3, (call it i)
    a. Look at the i^{th} character of encrypted (call it currChar)
    b. Find the index of currChar in the alphabet (call it idx)
    c. If currChar is in the alphabet
        i. Get the idx^{th} character of shiftedAlphabet (newChar)
        ii. Replace the i^{th} character of encrypted with newChar
    d. Otherwise: do nothing

Step 3: Find Patterns + Generalize

0. Make a StringBuilder with message (encrypted)
1. Write down the alphabet
2. Compute the shifted alphabet ← Requires some thought, but already saw how
3. Count from 0 to <= 3, (call it i)
    a. Look at the i^{th} character of encrypted (call it currChar)
    b. Find the index of currChar in the alphabet (call it idx)
    c. If currChar is in the alphabet
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Step 3: Find Patterns + Generalize

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    b. Find the index of currChar in the alphabet (call it idx)
    c. If currChar is in the alphabet
        i. Get the idx^{th} character of shiftedAlphabet (newChar)
        ii. Replace the i^{th} character of encrypted with newChar
    d. Otherwise: do nothing

Always start at 0?

Step 3: Find Patterns + Generalize

0. Make a StringBuilder with message (encrypted)
1. Write down the alphabet
2. Compute the shifted alphabet
3. Count from 0 to <= 3, (call it i)
    a. Look at the i^{th} character of encrypted (call it currChar)
    b. Find the index of currChar in the alphabet (call it idx)
    c. If currChar is in the alphabet
        i. Get the idx^{th} character of shiftedAlphabet (newChar)
        ii. Replace the i^{th} character of encrypted with newChar
    d. Otherwise: do nothing

Always end at 3?

Step 3: Find Patterns + Generalize

0. Make a StringBuilder with message (encrypted)
1. Write down the alphabet
2. Compute the shifted alphabet
3. Count from 0 to < length of encrypted, (call it i)
    a. Look at the i^{th} character of encrypted (call it currChar)
    b. Find the index of currChar in the alphabet (call it idx)
    c. If currChar is in the alphabet
        i. Get the idx^{th} character of shiftedAlphabet (newChar)
        ii. Replace the i^{th} character of encrypted with newChar
    d. Otherwise: do nothing

No: length of encrypted

Step 4: Test Steps

0. Make a StringBuilder with message (encrypted)
1. Write down the alphabet
2. Compute the shifted alphabet
3. Count from 0 to < length of encrypted, (call it i)
    a. Look at the i^{th} character of encrypted (call it currChar)
    b. Find the index of currChar in the alphabet (call it idx)
    c. If currChar is in the alphabet
        i. Get the idx^{th} character of shiftedAlphabet (newChar)
        ii. Replace the i^{th} character of encrypted with newChar
    d. Otherwise: do nothing

```
Message   A BAT
Key       19
```

Subtle problem:
Came up with right answer, but… did not specify what to give as answer!

Step 4: Test Steps

0. Make a StringBuilder with message (encrypted)
1. Write down the alphabet
2. Compute the shifted alphabet
3. Count from 0 to < length of encrypted, (call it i)
    a. Look at the i^{th} character of encrypted (call it currChar)
    b. Find the index of currChar in the alphabet (call it idx)
    c. If currChar is in the alphabet
        i. Get the idx^{th} character of shiftedAlphabet (newChar)
        ii. Replace the i^{th} character of encrypted with newChar
    d. Otherwise: do nothing
4. Your answer is the String inside of encrypted