**9.** **Write a high-level code for possible keys does the Playfair cipher have? Ignore the fact that some keys might produce identical encryption results. Express your answer as an approximate power of 2.**

**CODE:**

**import itertools**

**def find\_keyword():**

**alphabet = 'ABCDEFGHIKLMNOPQRSTUVWXYZ'**

**combinations = itertools.combinations(alphabet, 25)**

**for keyword in combinations:**

**matrix = [[0]\*5 for \_ in range(5)]**

**for i, letter in enumerate(keyword):**

**row = i // 5**

**col = i % 5**

**matrix[row][col] = letter**

**valid = True**

**for row in range(5):**

**for col in range(5):**

**if matrix[row][col] == 0:**

**valid = False**

**break**

**if matrix[row][col] == 'I' or matrix[row][col] == 'J':**

**matrix[row][col] = 'IJ'**

**if matrix[row][col] in matrix[row][col+1:] + [matrix[i][col] for i in range(row+1, 5)]:**

**valid = False**

**break**

**if not valid:**

**break**

**if valid:**

**return keyword**

**return None**

**keyword = find\_keyword()**

**if keyword is not None:**

**print(f"The keyword is {keyword}.")**

**print(f"Its approximate power of 2 is {2\*\*(len(keyword)\*5):,.0f}.")**

**else:**

**print("No valid keyword was found.")**

**OUTPUT:**

