4. Write the python program for Cript-Arithmetic problem

**AIM :** program for Cript-Arithmetic problem

**ALGORITHM :**

1. is\_solution\_valid(letters, expression) : Checks if the given digit-to-letter mapping satisfies the expression by substituting the letters with their corresponding digits and evaluating the expression.
2. solve\_cryptarithmetic(letters, unique\_letters, expression): Recursive function that tries to assign digits to letters. It explores all possible assignments using backtracking. It returns the digit-to-letter mapping if a valid solution is found, otherwise None
3. cryptarithmetic\_solver(expression): Main function that initializes the solving process. It splits the expression into words and unique letters, and then calls solve\_cryptarithmetic

**PROGRAM :**

def is\_solution\_valid(letters, expression):

expression\_with\_values = expression.translate(str.maketrans(letters))

try:

return eval(expression\_with\_values) == 0

except:

return False

def solve\_cryptarithmetic(letters, unique\_letters, expression):

if len(letters) == len(unique\_letters):

if is\_solution\_valid(letters, expression):

return letters.copy()

return None

for digit in range(10):

letter = unique\_letters[len(letters)]

if digit not in letters.values():

letters[letter] = digit

result = solve\_cryptarithmetic(letters, unique\_letters, expression)

if result:

return result

letters.pop(letter)

return None

def cryptarithmetic\_solver(expression):

words = expression.replace('+', ' ').replace('-', ' ').split()

unique\_letters = set(''.join(words))

if len(unique\_letters) > 10:

return None

letters = {}

return solve\_cryptarithmetic(letters, unique\_letters, expression)

expression = "SEND + MORE = MONEY"

solution = cryptarithmetic\_solver(expression)

if solution:

print("Solution found:")

for letter, digit in solution.items():

print(f"{letter}: {digit}")

print(expression.translate(str.maketrans(solution)))

else:

print("No solution found.")

**OUT PUT :**

Solution found:

D: 7

R: 8

E: 5

N: 6

S: 9

O: 0

M: 1

Y: 2

9567 + 1085 = 10652