Artificial Intelligence Lab

18CSC305J

Experiment – 3

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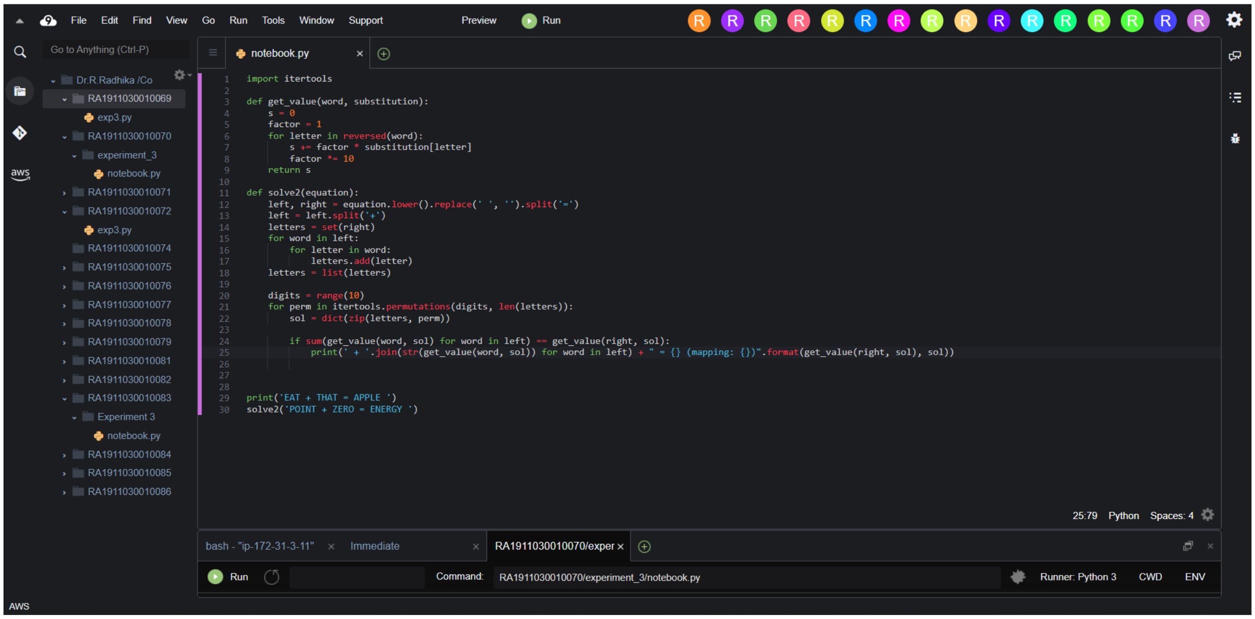
Title – Constraint Satisfaction Problem

Code (Python) –

```
import itertools


def get_value(word, substitution):
            s = 0
    factor = 1
            for letter in reversed(word):
        s += factor * substitution[letter]
        factor *= 10
    return s
```

```
def solve2(equation):

    left, right = equation.lower().replace(' ', '').split('=')

    left = left.split('+')

    letters = set(right)

            for word in left:

        for letter in word:

            letters.add(letter)

    letters = list(letters)


    digits = range(10)

            for perm in itertools.permutations(digits, len(letters)):

        sol = dict(zip(letters, perm))


        if sum(get_value(word, sol) for word in left) == get_value(right, sol):

                print(' + '.join(str(get_value(word, sol)) for word in left) + " = {} (mapping: {})".format(get_value(right, sol), sol))




print('EAT + THAT = APPLE ')

solve2('POINT + ZERO = ENERGY ')
```

Output:



```
import itertools

def get_value(word, substitution):
    s = 0
    factor = 1
    for letter in reversed(word):
        s += factor * substitution[letter]
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    return s

def solve2(equation):
    left, right = equation.lower().replace(' ', '').split('=')
    left = left.split('+')
    letters = set(right)
    for word in left:
        for letter in word:
            letters.add(letter)
    letters = list(letters)

    digits = range(10)
    for perm in itertools.permutations(digits, len(letters)):
        sol = dict(zip(letters, perm))

        if sum(get_value(word, sol) for word in left) == get_value(right, sol):
            print(' + '.join(str(get_value(word, sol)) for word in left) + " = {} (mapping: {})".format(get_value(right, sol), sol))



print('EAT + THAT = APPLE ')
solve2('POINT + ZERO = ENERGY ')
```
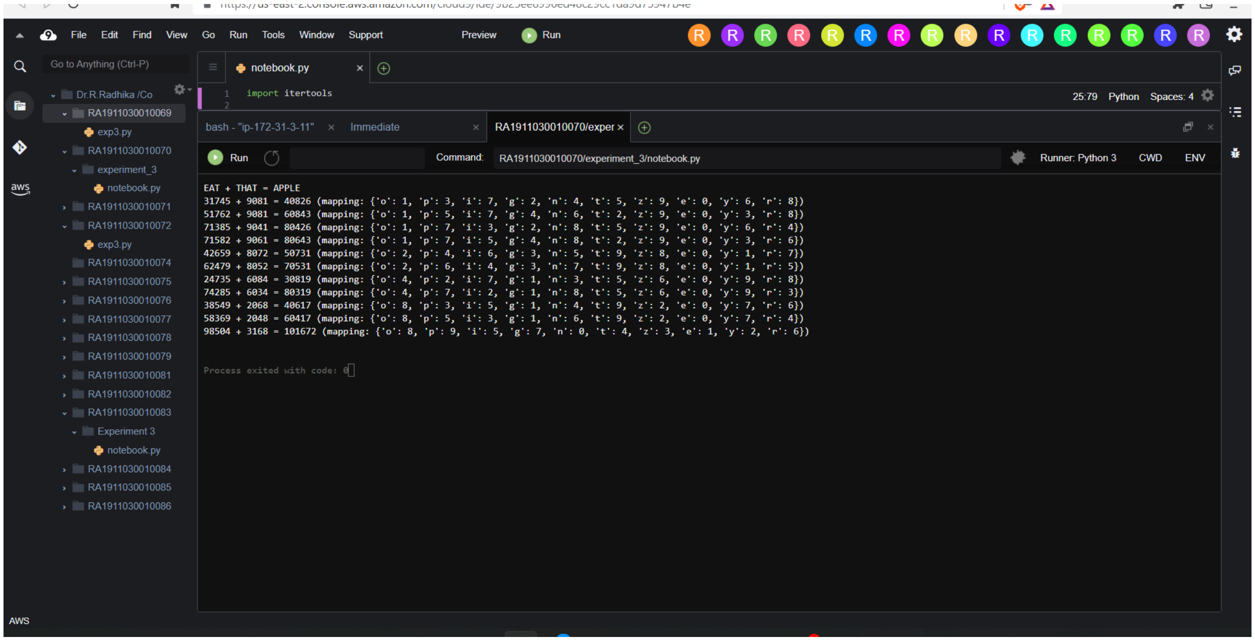

Command: RA1911030010070/experiment_3/notebook.py



Command: RA1911030010070/experiment_3/notebook.py

```
EAT + THAT = APPLE
31745 + 9081 = 40826 (mapping: {'o': 1, 'p': 3, 'i': 7, 'g': 2, 'n': 4, 't': 5, 'z': 9, 'e': 0, 'y': 6, 'r': 8})
51762 + 9081 = 60843 (mapping: {'o': 1, 'p': 5, 'i': 7, 'g': 4, 'n': 6, 't': 2, 'z': 9, 'e': 0, 'y': 3, 'r': 8})
71385 + 9041 = 80426 (mapping: {'o': 1, 'p': 7, 'i': 3, 'g': 2, 'n': 8, 't': 5, 'z': 9, 'e': 0, 'y': 6, 'r': 4})
71582 + 9061 = 80643 (mapping: {'o': 1, 'p': 7, 'i': 5, 'g': 4, 'n': 8, 't': 2, 'z': 9, 'e': 0, 'y': 3, 'r': 6})
42659 + 8072 = 50731 (mapping: {'o': 2, 'p': 4, 'i': 6, 'g': 3, 'n': 5, 't': 9, 'z': 8, 'e': 0, 'y': 1, 'r': 7})
62479 + 8052 = 70531 (mapping: {'o': 2, 'p': 6, 'i': 4, 'g': 3, 'n': 7, 't': 9, 'z': 8, 'e': 0, 'y': 1, 'r': 5})
24735 + 6084 = 30819 (mapping: {'o': 4, 'p': 2, 'i': 7, 'g': 1, 'n': 3, 't': 5, 'z': 6, 'e': 0, 'y': 9, 'r': 8})
74285 + 6034 = 80319 (mapping: {'o': 4, 'p': 7, 'i': 2, 'g': 1, 'n': 8, 't': 5, 'z': 6, 'e': 0, 'y': 9, 'r': 3})
38549 + 2068 = 40617 (mapping: {'o': 8, 'p': 3, 'i': 5, 'g': 1, 'n': 4, 't': 9, 'z': 2, 'e': 0, 'y': 7, 'r': 6})
58369 + 2048 = 60417 (mapping: {'o': 8, 'p': 5, 'i': 3, 'g': 1, 'n': 6, 't': 9, 'z': 2, 'e': 0, 'y': 7, 'r': 4})
98504 + 3168 = 101672 (mapping: {'o': 8, 'p': 9, 'i': 5, 'g': 7, 'n': 0, 't': 4, 'z': 3, 'e': 1, 'y': 2, 'r': 6})


Process exited with code: 0
```

Result:

The constraint satisfying problem SEND + MORE = MONEY solved using the carry over technique and values for the alphabets obtained successfully.