Assignment-1

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Roll no – TYCOC210

Batch - C3

Title - Write a program to compute square of 20-digit large integer numbers using divide and conquer strategy.

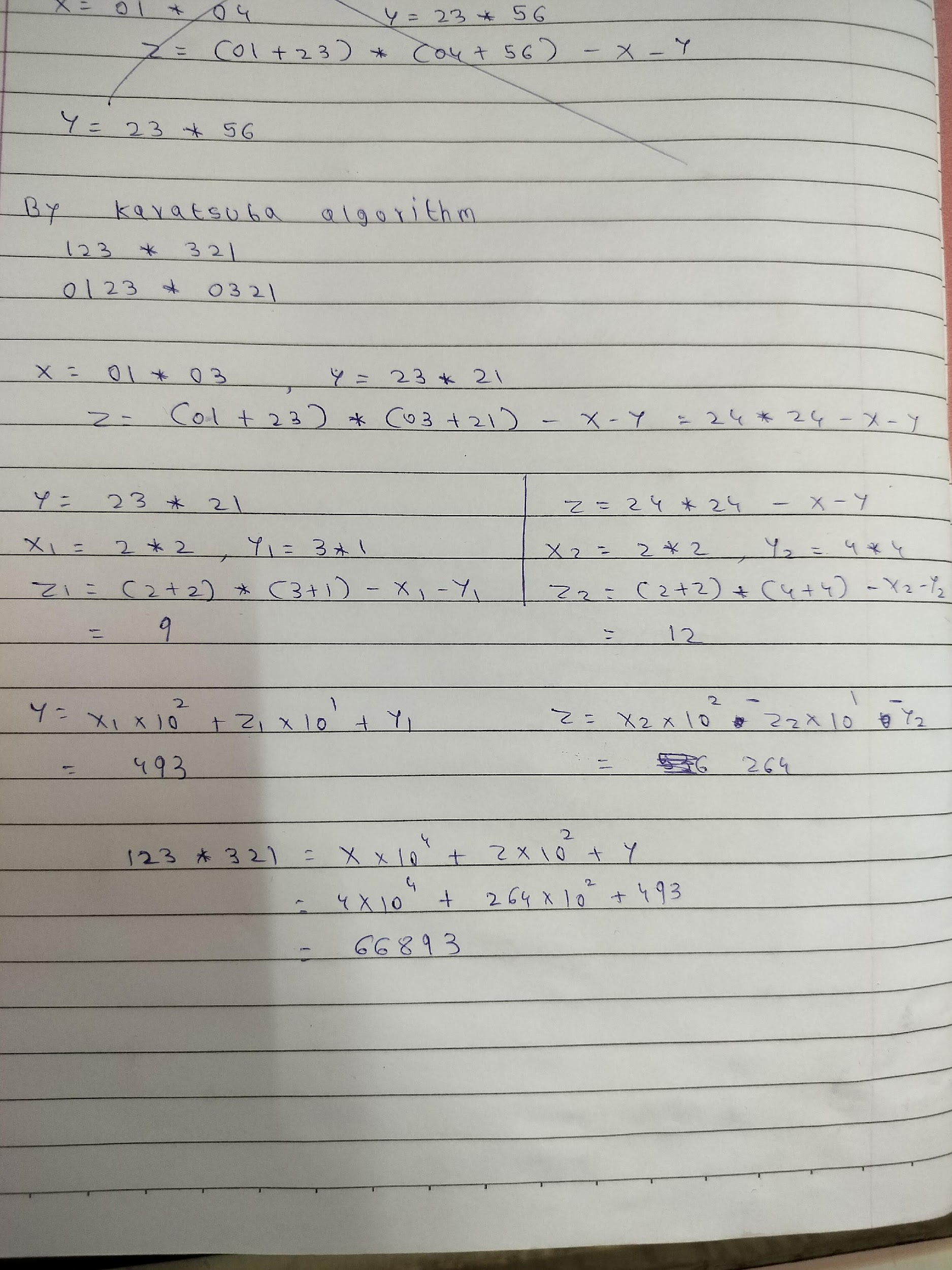
Theory -

1. The Karatsuba algorithm is a fast multiplicationb algorithm.

2. The basic principle of Karatsuba's algorithm is [divide-and-conquer](https://en.wikipedia.org/wiki/Divide-and-conquer_algorithm), using a formula that allows one to compute the product of two large numbers and using three multiplications of smaller numbers.

3. The time complexity of Karatsuba algorithm for fast multiplication is **O(n^log3)**.

Solved Example - 123\*321



Code -

from math import ceil, floor

def karatsuba(x,y):

if x < 10 and y < 10:

return x\*y

n = max(len(str(x)), len(str(y)))

m = ceil(n/2)

x\_H = floor(x / 10\*\*m)

x\_L = x % (10\*\*m)

y\_H = floor(y / 10\*\*m)

y\_L = y % (10\*\*m)

a = karatsuba(x\_H,y\_H)

d = karatsuba(x\_L,y\_L)

e = karatsuba(x\_H + x\_L, y\_H + y\_L) - a - d

return int(a\*(10\*\*(m\*2)) + e\*(10\*\*m) + d)

a = int(input("enter number: "))

print(karatsuba(a,a))

Output -

