



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
DEHRADUN

DAA LAB - 6

Karatsuba Technique for Integer Multiplication

MTECH-COMPUTER SCIENCE
ENGINEERING
CYBER SECURITY AND FORENSICS

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Title : Implementation of Karatsuba Technique for Integer Multiplication

Implementation: Language used : Python

```

karatsuba.py > ...
1  # Author: Jigesh Sheoran
2  # SAP ID: 590025428
3
4
5  def karatsuba_multiplication(x, y):
6
7      # base case - if numbers are small, use normal multiplication
8      if x < 10 or y < 10:
9          return x * y
10
11     # convert no. to strings for splitting
12     str_x = str(x)
13     str_y = str(y)
14
15     n = max(len(str_x), len(str_y))
16     m = n // 2 # split halfway
17
18     # powers of 10 for splitting
19     power_m = 10 ** m
20     power_2m = 10 ** (2 * m)
21
22     # split the no.s into two halves
23     a = x // power_m
24     b = x % power_m
25     c = y // power_m
26     d = y % power_m
27
28     # recursive multiplication
29     Z2 = karatsuba_multiplication(a, c)
30     Z0 = karatsuba_multiplication(b, d)
31     Z1 = karatsuba_multiplication(a + b, c + d) - Z2 - Z0
32
33     # combine results
34     result = Z2 * power_2m + Z1 * power_m + Z0
35
36     return result
37
38
39 if __name__ == "__main__":
40     print("***** Karatsuba Multiplication Algorithm *****\n")

```

```

41
42     # Taking input from user
43     num1 = int(input("Enter first number (A): "))
44     num2 = int(input("Enter second number (B): "))
45
46     # Perform Karatsuba Multiplication
47     karatsuba_result = karatsuba_multiplication(num1, num2)
48     standard_result = num1 * num2
49
50     # Display Results
51     print("\n----- Result -----")
52     print(f"Number 1 (A): {num1}")
53     print(f"Number 2 (B): {num2}")
54     print(f"\nKaratsuba Result: {karatsuba_result}")
55     print(f"Standard Result: {standard_result}")
56     print(f"\nVerification (Both Match?): {karatsuba_result == standard_result}")
57
58     print("\n Program executed successfully \n")
59

```



Output:

```

PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS
zsh +  [ ] [ ] ... [ ] [ ] x
/usr/local/bin/python3 "/Users/sheoraninfosec/Documents/Masters UPES/DAA/assignment 6/karatsuba.py"
sheoraninfosec@Jigeshs-MacBook-Air assignment 6 % /usr/local/bin/python3 "/Users/sheoraninfosec/Documents/Masters UPES/DAA/assignment 6/karatsuba.py"
**** Karatsuba Multiplication Algorithm ****

Enter first number (A): 453
Enter second number (B): 234

----- Result -----
Number 1 (A): 453
Number 2 (B): 234

Karatsuba Result: 106002
Standard Result: 106002

Verification (Both Match?): True

Program executed successfully

sheoraninfosec@Jigeshs-MacBook-Air assignment 6 %

```

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