83. Karatsuba algorithm for multiplication

AIM: Karatsuba algorithm for multiplication by using divide and conquer method

PROGRAM:

```
def karatsuba(x, y):
    if x < 10 or y < 10:
        return x * y
    n = max(len(str(x)), len(str(y)))
    n2 = n // 2
    high1, low1 = divmod(x, 10**n2)
    high2, low2 = divmod(y, 10**n2)
    z0 = karatsuba(low1, low2)
    z1 = karatsuba((low1 + high1), (low2 + high2))
    z2 = karatsuba(high1, high2)
    return (z2 * 10*(2*n2)) + ((z1 - z2 - z0) * 10*n2) + z0
num1 = 123456789
num2 = 987654321
result = karatsuba(num1, num2)
print(f"Karatsuba multiplication of {num1} and {num2} is: {result}")
```

OUTPUT:

```
Karatsuba multiplication of 123456789 and
    987654321 is: 121932631112635269
```

TIME COMPLEXITY: O(n ^$\log_2 3$)