6. Karatsuba algorithm for multiplication.

Code:

```
def karatsuba(x,y):
   if x<10 or y<10:
      return x*y
   n=max(len(str(x)),len(str(y)))
   m=n//2
   high1, low1=divmod(x,10**m)
   high2, low2=divmod(y,10**m)
   z0 = karatsuba(low1,low2)
   z1 = karatsuba((low1 + high1), (low2 + high2))
   z2 = karatsuba(high1,high2)
   return (z2 * 10**(2*m)) + ((z1 - z2 - z0) * 10**m) + z0
x = 1234
y = 5678
result = karatsuba(x, y)
print(f"Karatsuba multiplication of {x} and {y} is {result}")
```

output:

```
PS C:\Users\karth>
PS C:\Users\karth> & C:/Users/karth/AppData/Local/Programs/Python/Python312/python.exe c:/Users/karth/OneDrive/Desktop/daa.py
Karatsuba multiplication of 1234 and 5678 is 7006652
PS C:\Users\karth>
```

Time complexity:

$F(n)=o(n^2)$