```python
import random
import time


def Bubble_Sort(A):  # 3 usages  new *
    for i in range(len(A)):
        for j in range(len(A) - i - 1):
            if A[j] > A[j + 1]:
                temp = A[j]
                A[j] = A[j + 1]
                A[j + 1] = temp


def Insertion_Sort(A):  # 3 usages  new *
    for i in range(1, len(A)):
        j = i - 1
        key = A[i]
        while j >= 0 and key < A[j]:
            A[j + 1] = A[j]
            j -= 1
        A[j + 1] = key


A = [random.randint(1, 100) for i in range(100)]
ATmp = A.copy()
B = [random.randint(1, 100) for i in range(1000)]
BTmp = B.copy()
C = [random.randint(1, 100) for i in range(10000)]
CTmp = C.copy()
print("Before sort: ", end = "")
print(A)
start1 = time.time()
print("After sort: ", end = "")
```

```python
    print("Before sort: ", end = "")
    print(A)
    start1 = time.time()
    print("After sort: ", end = "")
    Bubble_Sort(A)
    end1 = time.time()
    print(A)

    print("Before sort: ", end = "")
    print(ATmp)
    start2 = time.time()
    print("After sort: ", end = "")
    Insertion_Sort(ATmp)
    end2 = time.time()
    print(ATmp)

    print("data num = 100, Bubble Sort time : ", end = "")
    print(end1 - start1)
    print("data num = 100, Insertion Sort time : ", end = "")
    print(end2 - start2)

    print("Before sort: ", end = "")
    print(B)
    start3 = time.time()
    print("After sort: ", end = "")
    Bubble_Sort(B)
    end3 = time.time()
    print(B)

    print("Before sort: ", end = "")
    print(BTmp)
    start4 = time.time()
    print("After sort: ", end = "")
```

```python
start4 = time.time()
print("After sort: ", end = "")
Insertion_Sort(BTmp)
end4 = time.time()
print(BTmp)

print("data num = 1000, Bubble Sort time : ", end = "")
print(end3 - start3)
print("data num = 1000, Insertion Sort time : ", end = "")
print(end4 - start4)

print("Before sort: ", end = "")
print(C)
start5 = time.time()
print("After sort: ", end = "")
Bubble_Sort(C)
end5 = time.time()
print(C)

print("Before sort: ", end = "")
print(CTmp)
start6 = time.time()
print("After sort: ", end = "")
Insertion_Sort(CTmp)
end6 = time.time()
print(CTmp)

print("data num = 10000, Bubble Sort time : ", end = "")
print(end5 - start5)
print("data num = 10000, Insertion Sort time : ", end = "")
print(end6 - start6)
```

```
/usr/local/bin/python3.12 /Users/pengyenjia/Desktop/運算思維與程式設計/makeUp_Submission_py/6_3/回家作業/11227130_資訊二甲_彭妍嘉 6_3.py
Before sort: [96, 6, 82, 35, 11, 1, 94, 62, 93, 91, 95, 45, 90, 1, 34, 94, 20, 6, 7, 26, 97, 85, 17, 31, 20, 68, 65, 47, 5, 58, 6, 59, 88, 26, 55, 70, 38, 48, 30, 22,
After sort: [1, 1, 1, 3, 3, 4, 5, 6, 6, 6, 6, 7, 11, 14, 15, 15, 16, 17, 18, 18, 20, 20, 22, 22, 26, 26, 28, 28, 29, 30, 31, 31, 31, 32, 33, 34, 35, 36, 37, 38, 38, 39
Before sort: [96, 6, 82, 35, 11, 1, 94, 62, 93, 91, 95, 45, 90, 1, 34, 94, 20, 6, 7, 26, 97, 85, 17, 31, 20, 68, 65, 47, 5, 58, 6, 59, 88, 26, 55, 70, 38, 48, 30, 22,
After sort: [1, 1, 1, 3, 3, 4, 5, 6, 6, 6, 6, 7, 11, 14, 15, 15, 16, 17, 18, 18, 20, 20, 22, 22, 26, 26, 28, 28, 29, 30, 31, 31, 31, 32, 33, 34, 35, 36, 37, 38, 38, 39
data num = 100, Bubble Sort time : 0.0002219676971435547
data num = 100, Insertion Sort time : 9.918212890625e-05
Before sort: [15, 13, 5, 38, 77, 73, 5, 72, 28, 85, 99, 31, 59, 92, 41, 1, 18, 23, 22, 34, 95, 65, 96, 8, 52, 19, 55, 77, 79, 5, 99, 60, 77, 89, 50, 34, 76, 42, 2, 29,
After sort: [1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 4, 4, 4, 4, 4, 4, 4, 4, 4, 5, 5, 5, 5, 5
Before sort: [15, 13, 5, 38, 77, 73, 5, 72, 28, 85, 99, 31, 59, 92, 41, 1, 18, 23, 22, 34, 95, 65, 96, 8, 52, 19, 55, 77, 79, 5, 99, 60, 77, 89, 50, 34, 76, 42, 2, 29,
After sort: [1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 4, 4, 4, 4, 4, 4, 4, 4, 4, 5, 5, 5, 5, 5
data num = 1000, Bubble Sort time : 0.041042327880859375
data num = 1000, Insertion Sort time : 0.018357038497924805
Before sort: [45, 83, 20, 46, 29, 41, 79, 17, 98, 100, 77, 91, 95, 51, 90, 19, 88, 93, 62, 44, 43, 83, 24, 4, 28, 36, 33, 32, 96, 25, 50, 44, 90, 87, 2, 72, 35, 59, 18
After sort: [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1
Before sort: [45, 83, 20, 46, 29, 41, 79, 17, 98, 100, 77, 91, 95, 51, 90, 19, 88, 93, 62, 44, 43, 83, 24, 4, 28, 36, 33, 32, 96, 25, 50, 44, 90, 87, 2, 72, 35, 59, 18
After sort: [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1
data num = 10000, Bubble Sort time : 3.0488688945770264
data num = 10000, Insertion Sort time : 1.3010778427124023

Process finished with exit code 0
```