

# (Time) Complexities

## (時間) 複雜度們

2023 (C) 黃敦紀 Elton

December 24, 2023

```
n = int (input ()) # 總共有幾個數字
look = int (input ())
seq = list (map (int, input().split()))

i = 0
while i < n:
    if seq [i] == look:
        break
    else:
        i = i + 1

print (-1 if i == n - 1 and seq [-1] != look else i)
```

$O(?)$

```
print (123)
```

$O(?)$

```
total, start, npass = map (int, input().split())  
print ((start + npass) % total)
```

$O(?)$

```
n = int (input ())

if n >= 60:
    print ("及格")
elif n >= 55:
    print ("勉强及格")
elif n >= 40:
    print ("補考")
else:
    print ("直接重補修")
```

$O(?)$

```
n = int (input ())  
acc = 0  
  
while n > 0:  
    acc = acc + n  
    n = n - 1  
  
print (acc)
```

$O(?)$

```
n = int (input ())  
factorial = 1  
  
while n > 0:  
    factorial = factorial * n  
    n = n - 1  
  
print (factorial)
```

$O(?)$

```
n = int (input ())  
acc = 0  
  
while n > 0:  
    acc = acc + n  
    n = n - 1  
  
print (acc)
```

```
n = int (input ())  
factorial = 1  
  
while n > 0:  
    factorial = factorial * n  
    n = n - 1  
  
print (factorial)
```



```

a1, b1, c1 = map (int, input().split())
a2, b2, c2 = map (int, input().split())
n = int (input ())

mx = -9999999999
x1 = 0

while x1 <= n:
    y1 = a1 * x1 * x1 + b1 * x1 + c1
    x2 = n - x1
    y2 = a2 * x2 * x2 + b2 * x2 + c2
    if mx < y1 + y2:
        mx = y1 + y2
    x1 = x1 + 1

print (mx)

```

$O(?)$

```
n, r = map (int, input().split())

pnr = 1

i = 0
while i < r:
    pnr = pnr * (n - i)
    i = i + 1

print(pnr)
```

$O(?)$

```
m, n = map (int, input().split())

i = 1
while i <= m:
    j = 1
    while j <= n:
        print (i * j)
        j = j + 1
    i = i + 1
```

$O(?)$

```
n = int (input ())

i = 1
while i <= n:
    j = 1
    while j <= n:
        pass # or do something
        j = j + 1
    i = i + 1
```

$O(?)$

```

m, n = map (int, input().split())

i = 1
while i <= m:
    j = 1
    while j <= n:
        print (i * j)
        j = j + 1
    i = i + 1

```

```

n = int (input ())

i = 1
while i <= n:
    j = 1
    while j <= n:
        pass # or do something
        j = j + 1
    i = i + 1

```

```
n = int (input())  
  
while n % 2 == 0:  
    n = n // 2  
  
print (n)
```

$O(?)$

```
n = int (input())  
i = 1  
c = 0  
while i < n:  
    c = c + 1  
    i = i * 2  
  
print (i, c)
```

$O(?)$

```
n = int (input())

while n % 2 == 0:

    n = n // 2

print (n)
```

```
n = int (input())
i = 1
c = 0
while i < n:
    c = c + 1
    i = i * 2

print (i, c)
```



```
n = int (input())

c = 0
i = 0
while i < n:
    j = 1
    while j < n:
        c = c + 1
        j = j * 2
    i = i + 1

print (c)
```

$O(?)$

```
n = int (input())

c = 0
i = 0
while i < n:
    j = 1
    while j < n:
        c = c + 1
        j = j + 1
    i = i * 2

print (c)
```

$O(?)$

```
n = int (input())
```

```
c = 0
```

```
i = 0
```

```
while i < n:
```

```
    j = 1
```

```
    while j < n:
```

```
        c = c + 1
```

```
        j = j * 2
```

```
    i = i + 1
```

```
print (c)
```

```
n = int (input())
```

```
c = 0
```

```
i = 0
```

```
while i < n:
```

```
    j = 1
```

```
    while j < n:
```

```
        c = c + 1
```

```
        j = j + 1
```

```
    i = i * 2
```

```
print (c)
```

```
n = int (input ()) # 總共有幾個數字
look = int (input ())
seq = list (map (int, input().split()))

i = 0
while i < n:
    if seq [i] == look:
        break
    else:
        i = i + 1

print (-1 if i == n - 1 and seq [-1] != look else i)
```

$O(?)$

```
n = int (input ()) # 總共有幾個數字
look = int (input ())
seq = list (map (int, input().split()))

left = 0
rite = n - 1

while rite >= left:
    mid = (left + rite) // 2
    if seq [mid] == look:
        break
    elif seq [mid] < look:      # look 會在 seq [mid] 的右邊
        left = mid + 1
    else: # seq [mid] > look, # look 會在 seq [mid] 的左邊
        rite = mid - 1

print (mid if rite >= left else -1)
```

$O(?)$

```
n = int (input ())
look = int (input ())
seq = list (map (int, ...))

i = 0

while i < n:

    if seq [i] == look:
        break
    else:
        i = i + 1

print (-1 if ... else i)
```

```
n = int (input ())
look = int (input ())
seq = list (map (int, ...))

left = 0
rite = n - 1

while rite >= left:
    mid = (left + rite) // 2
    if seq [mid] == look:
        break
    elif seq [mid] < look:
        left = mid + 1
    else:
        rite = mid - 1

print (mid if ... else -1)
```

```
seq = list (map (int, ...))
# 不用一次性的前置作業

while True:
    try: # 每次查詢  $O(n)$ 
        look = input ("Look for? ")

        i = 0
        while i < n:

            if seq [i] == look:
                break
            else:
                i = i + 1

        print (-1 if ... else i)
    except EOFError:
        break
```

```
seq = list (map (int, ...))
sort (seq) #  $O(n \log(n))$ 

while True:
    try: # 每次查詢  $O(\log(n))$ 
        look = input ("Look for? ")
        left = 0
        rite = n - 1
        while rite >= left:
            mid = (left + rite) // 2
            if seq [mid] == look:
                break
            elif seq [mid] < look:
                left = mid + 1
            else:
                rite = mid - 1
        print (mid if ... else -1)
    except EOFError:
        break
```

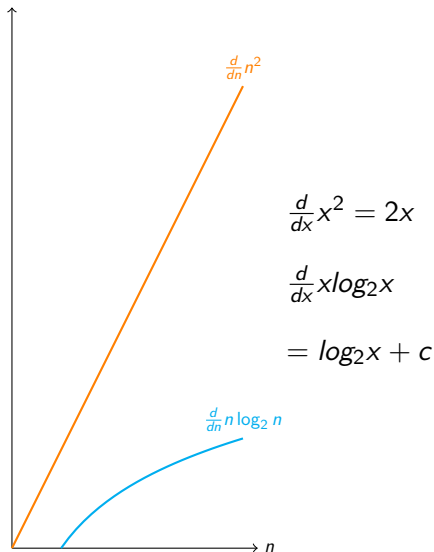
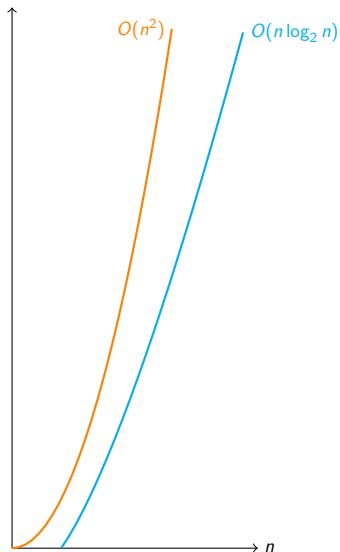
```
seq = list (map (int, ...))  
# 不用一次性的前置作業  
  
for _ in range (n):  
    look = input ("Look for? ")  
  
    i = 0  
    while i < n:  
  
        if seq [i] == look:  
            break  
        else:  
            i = i + 1  
  
    print (-1 if ... else i)
```

 $O(n^2)$ 

```
seq = list (map (int, ...))  
sort (seq) #  $O(n \log(n))$   
  
for _ in range (n):  
    look = input ("Look for? ")  
    left = 0  
    rite = n - 1  
    while rite >= left:  
        mid = (left + rite) // 2  
        if seq [mid] == look:  
            break  
        elif seq [mid] < look:  
            left = mid + 1  
        else:  
            rite = mid - 1  
    print (mid if ... else -1)
```

 $O(n \times \log_2 n)$





```
look = int (input ())  
wheres = list (map (int, input().split()))  
  
print (wheres [look]) # 查表
```

$O(?)$

## 建表

```
n = int (input ()) # 總共有幾個數字
seq = list (map (int, input().split()))
# 假設 seq 中的數字為 1~99 不重複

wheres = [ -1 ] * 100

i = 0
while i < n:
    wheres [seq [i]] = i
```

$O(?)$

```
n = int (input ()) # 總共有幾個數字
seq = list (map (int, input().split()))
# 假設 seq 中的數字為 1~99 不重複

wheres = [ -1 ] * 100 # 犧牲空間複雜度

i = 0
while i < n: # 一次性作業  $O(n)$ 
    wheres [seq [i]] = i
    i = i + 1

while True:
    try: # 每次查詢  $O(1)$ 
        print (wheres [input ("Look for? ")])
    except EOFError:
        break
```