Big O notation

จงอธิบายจำนวนรอบของการทำงานของโปรแกรมดังต่อไปนี้ และประเมิน O Θ Ω

1. จาก Select number game ข้างต้นหากใช้ 3 วิธีดังต่อไปนี้ กับ input จำนวน N ตัวเลข ที่จะให้ต่อไปในตาราง จงหารอบการทำงานโดยประมาณ (estimated iteration) และ O Θ Ω
   1. Brute force selected game
   2. Brute force selected game (fixed minimum)
   3. Greedy selected game
2. Brute force

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| N | iteration | O | Θ | Ω |
| 4 | 640 | N^4 |  | N^4 |
| 8 |  | N^4 |  | N^4 |
| 16 |  | N^4 |  | N^4 |
| 32 |  | N^4 |  | N^4 |
| 100 | 10\*100^4 | N^4 |  | N^4 |
| 1000 | 10\*1000^4 | N^4 |  | N^4 |

1. Brute force

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| N | iteration | O | Θ | Ω |
| 4 | 7\*4^3 | N^3 |  | N^3 |
| 8 | 7\*8^3 |  |  |  |
| 16 | 7\*16^3 |  |  |  |
| 32 |  |  |  |  |
| 100 |  |  |  |  |
| 1000 |  |  |  |  |

1. Greedy

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| N | iteration | O | Θ | Ω |
| 4 | 3 | 1 |  | 1 |
| 8 | 3 | 1 |  | 1 |
| 16 | 3 |  |  |  |
| 32 | 3 |  |  |  |
| 100 | 3 |  |  |  |
| 1000 | 3 |  |  |  |

1. จาก input set ดังต่อไปนี้ จงหารอบการทำงานโดยประมาณ (estimated iteration) และ O Ω ของ
   1. Linear search
   2. Binary search
2. Linear search

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| N | target | iteration | O | Ω |
| {12,11,10,4,2,1,0} | 12 | 1 | n | 1 |
| {12,11,10,4,2,1,0} | 10 | 3 | N | 1 |
| {12,11,10,4,2,1,0} | 0 | 7 | N | 1 |
| {12,11,10,4,2,1,0} | -20 | 7 | n |  |
| {20,19,18,17,16,15,14,13,12,11,10,9,4,2,1,0,} | 18 |  |  |  |
| {20,19,18,17,16,15,14,13,12,11,10,9,4,2,1,0,} | 17 |  |  |  |
| {20,19,18,17,16,15,14,13,12,11,10,9,4,2,1,0,} | 2 |  |  |  |
| {20,19,18,17,16,15,14,13,12,11,10,9,4,2,1,0,} | 0 |  |  |  |
| {20,19,18,17,16,15,14,13,12,11,10,9,4,2,1,0,} | -20 |  |  |  |

1. Binary search

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| N | target | iteration | O | Ω |
| {12,11,10,4,2,1,0} | 12 |  |  |  |
| {12,11,10,4,2,1,0} | 10 |  |  |  |
| {12,11,10,4,2,1,0} | 0 |  |  |  |
| {12,11,10,4,2,1,0} | -20 |  |  |  |
| {20,19,18,17,16,15,14,13,12,11,10,9,4,2,1,0,} | 18 |  |  |  |
| {20,19,18,17,16,15,14,13,12,11,10,9,4,2,1,0,} | 17 |  |  |  |
| {20,19,18,17,16,15,14,13,12,11,10,9,4,2,1,0,} | 2 |  |  |  |
| {20,19,18,17,16,15,14,13,12,11,10,9,4,2,1,0,} | 0 |  |  |  |
| {20,19,18,17,16,15,14,13,12,11,10,9,4,2,1,0,} | -20 |  |  |  |

1. จาก input set ดังต่อไปนี้ จงหารอบการทำงานโดยประมาณ (estimated iteration) และ O Θ Ω ของ
   1. normal bubble sort
   2. n\*n bubble sort
   3. limited bubble sort
2. normal bubble sort

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| N | iteration | O | Θ | Ω |
| {8,17,16,5,9,7,1,3,2} |  |  |  |  |
| {1,2,3,4,5,6,7,8} |  |  |  |  |
| {1,2,3,4} |  |  |  |  |
| {16,15,14,13,12,11,10,9,8,7,6,5,4,3,2,1} |  |  |  |  |
| {1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16} |  |  |  |  |

1. n\*n bubble sort

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| N | iteration | O | Θ | Ω |
| {8,17,16,5,9,7,1,3,2} |  |  |  |  |
| {1,2,3,4,5,6,7,8} |  |  |  |  |
| {1,2,3,4} |  |  |  |  |
| {16,15,14,13,12,11,10,9,8,7,6,5,4,3,2,1} |  |  |  |  |
| {1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16} |  |  |  |  |

1. limited bubble sort

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| N | iteration | O | Θ | Ω |
| {8,17,16,5,9,7,1,3,2} |  |  |  |  |
| {1,2,3,4,5,6,7,8} |  |  |  |  |
| {1,2,3,4} |  |  |  |  |
| {16,15,14,13,12,11,10,9,8,7,6,5,4,3,2,1} |  |  |  |  |
| {1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16} |  |  |  |  |