

Algorithms Assignment 3: Searching and Hashing

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October 28, 2020

1 Linear Search

Linear Search has an asymptotic runtime of $O(n)$. This is because it must traverse the entire array looking for an element. In the worse case scenario, the element we are looking for would be at the end of the list and we would have to check n elements.

Element	Comparisons
AVERAGE	358
SADDLE OF STABILITY	338
CRYSTAL OF (SPECIFIC CREATURE) FINDING	166
NECKLACE OF FIREBALLS TYPE IV	475
BOOTS OF STRIDING AND SPRINGING	208
AMULET OF MIGHTY FISTS +4	65
GARMENT OF YVETH	415
BAG OF THORNS	416
DUST OF TRACELESSNESS	541
RING OF ARMORING	142
EFFICIENT QUIVER	624
MANTLE OF SPELL RESISTANCE	402
WALKING STICK +3	240
VAMBRACES OF UNARMED PROWESS	305
SHIELD OF ATTACHMENT	289
AIBOHPHOBIA	615
SEARING TOTEM	393
AMULET OF NATURAL ARMOR +1	315
MIRROR OF OPPOSITION	612
WIND FAN	368
ELIXIR OF LOVE	94
CANDLE OF TRUTH	113
PO-TIEN'S STONEY BLADE	35
MUG OF INFINITE THIRST	375
AMULET OF MIGHTY FISTS +1	586
SACK OF PLUNDER	143
CENSER OF CONTROLLING AIR ELEMENTALS	225
BELT OF KEEPING	656
TOME OF UNDERSTANDING +4	618
SWORD PIN	413
RING OF FLICKERING	651
GREAT SWORD	544
SOVEREIGN GLUE	443
POTION OF DREAMING	462
CLOAK OF THE MANTA RAY	43
BROOCH OF SHIELDING	342
WARTEXX	47
THE HAWKBLADE	349
HIDE OF TRANSFORMATION	381
AMULET OF FALSE RACE	91
STAFF OF TRIPPING	465
CLOAK OF BLACKSHADOWS	545
BAG OF TRICKS, TAN	527

2 Binary Search

Binary Search has an asymptotic runtime of $O(\log n)$. This is because it divides the array into smaller and smaller halves as we look for the element. It is the same concept as merge sort, however without the "conquer" aspect, which is why it is $O(\log n)$ not $O(n \log n)$.

Element	Comparisons
AVERAGE	8
SADDLE OF STABILITY	9
CRYSTAL OF (SPECIFIC CREATURE) FINDING	10
NECKLACE OF FIREBALLS TYPE IV	5
BOOTS OF STRIDING AND SPRINGING	8
AMULET OF MIGHTY FISTS +4	9
GARMENT OF YVETH	10
BAG OF THORNS	11
DUST OF TRACELESSNESS	7
RING OF ARMORING	9
EFFICIENT QUIVER	8
MANTLE OF SPELL RESISTANCE	9
WALKING STICK +3	8
VAMBRACES OF UNARMED PROWESS	10
SHIELD OF ATTACHMENT	9
AIBOHPHOBIA	9
SEARING TOTEM	7
AMULET OF NATURAL ARMOR +1	9
MIRROR OF OPPOSITION	8
WIND FAN	6
ELIXIR OF LOVE	9
CANDLE OF TRUTH	10
PO-TIEN'S STONEY BLADE	6
MUG OF INFINITE THIRST	8
AMULET OF MIGHTY FISTS +1	6
SACK OF PLUNDER	7
CENSER OF CONTROLLING AIR ELEMENTALS	6
BELT OF KEEPING	8
TOME OF UNDERSTANDING +4	10
SWORD PIN	9
RING OF FLICKERING	8
GREAT SWORD	10
SOVEREIGN GLUE	11
POTION OF DREAMING	8
CLOAK OF THE MANTA RAY	9
BROOCH OF SHIELDING	8
WARTEXX	10
THE HAWKBLADE	7
HIDE OF TRANSFORMATION	9
AMULET OF FALSE RACE	10
STAFF OF TRIPPING	8
CLOAK OF BLACKSHADOWS	10
BAG OF TRICKS, TAN	8

3 Hash Table

Searching using a Hash Table has the asymptotic runtime of $O(1)$. This is because we know where each element is going to be in the Hash Table every time and we don't actually have to search for it. Even when we use chaining, it still takes the same amount of time to find the last element in a chain as it would the first element in the chain.

Element	Comparisons
AVERAGE	1
SADDLE OF STABILITY	3
CRYSTAL OF (SPECIFIC CREATURE) FINDING	1
NECKLACE OF FIREBALLS TYPE IV	3
BOOTS OF STRIDING AND SPRINGING	1
AMULET OF MIGHTY FISTS +4	1
GARMENT OF YVETH	1
BAG OF THORNS	1
DUST OF TRACELESSNESS	1
RING OF ARMORING	2
EFFICIENT QUIVER	2
MANTLE OF SPELL RESISTANCE	3
WALKING STICK +3	3
VAMBRACES OF UNARMED PROWESS	3
SHIELD OF ATTACHMENT	3
AIBOHPHOBIA	1
SEARING TOTEM	4
AMULET OF NATURAL ARMOR +1	1
MIRROR OF OPPOSITION	1
WIND FAN	6
ELIXIR OF LOVE	1
CANDLE OF TRUTH	1
PO-TIEN'S STONEY BLADE	2
MUG OF INFINITE THIRST	1
AMULET OF MIGHTY FISTS +1	1
SACK OF PLUNDER	5
CENSER OF CONTROLLING AIR ELEMENTALS	1
BELT OF KEEPING	1
TOME OF UNDERSTANDING +4	4
SWORD PIN	4
RING OF FLICKERING	3
GREAT SWORD	4
SOVEREIGN GLUE	3
POTION OF DREAMING	5
CLOAK OF THE MANTA RAY	1
BROOCH OF SHIELDING	1
WARTEXX	5
THE HAWKBLADE	3
HIDE OF TRANSFORMATION	2
AMULET OF FALSE RACE	1
STAFF OF TRIPPING	3
CLOAK OF BLACKSHADOWS	1
BAG OF TRICKS, TAN	1