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04 Algorithm Analysis

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constant $\Theta(1)$

logarithmic $\Theta(\log_{\square} n)$

linear $\Theta(n)$

$\Theta(n \cdot \log n)$

quadratic $\Theta(n^2)$

polynomial $\Theta(n^3)$

exponential $\Theta(a^n)$

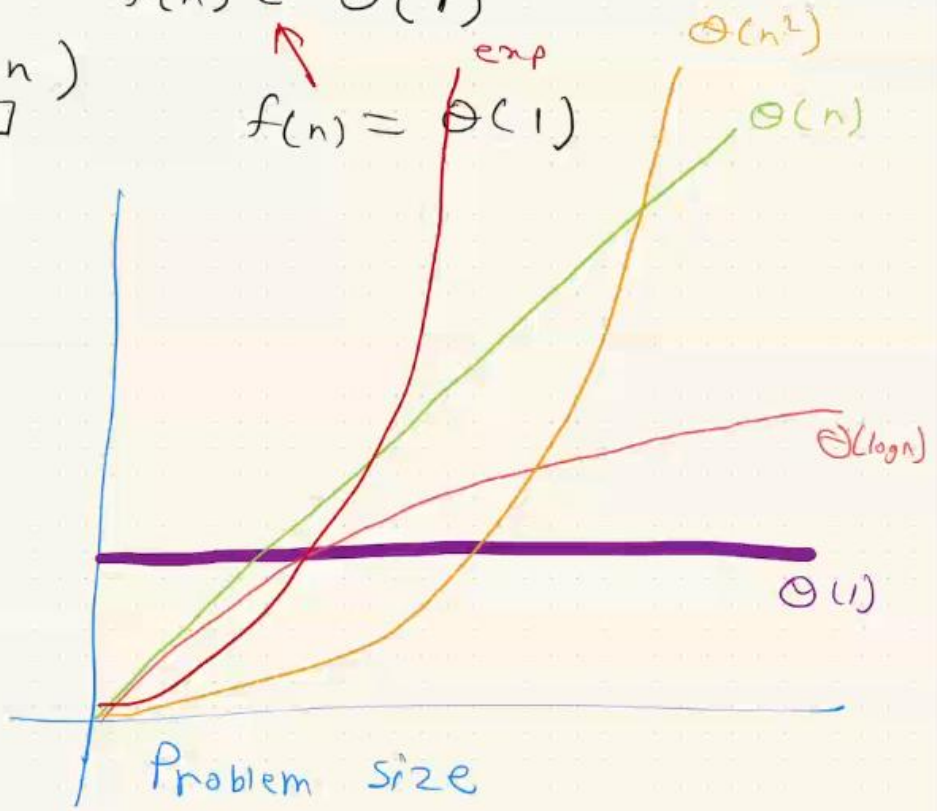
$a \leq e^2$

factorial $\Theta(n!)$

$f(n) \in \Theta(1)$

exp

$f(n) = \Theta(1)$



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05 ADT

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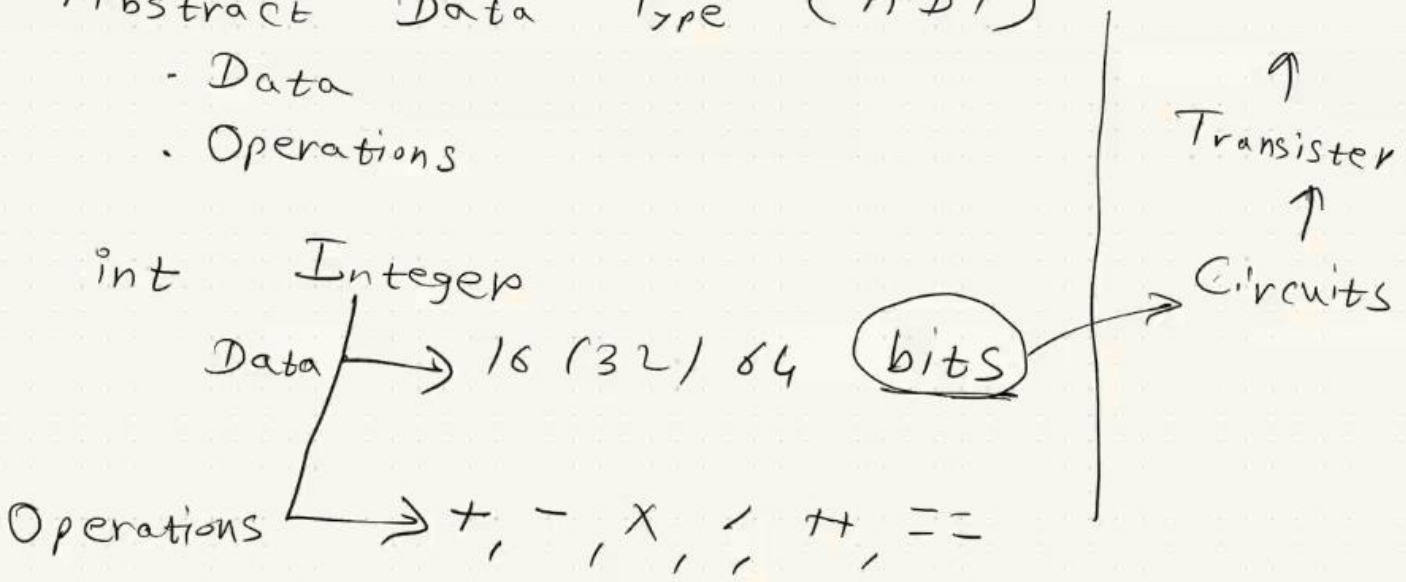
Abstract Data Type (ADT)

- Data
- Operations



- Access to data is only through operations
- Implementation details need not be shared
- Naturally translates to OOP languages

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Array : Implementation with contiguous memory

createNew(5) : ~~$O(n)$~~ $O(1)$

createNew(capacity, defaultVal)

createNew(5, 500)

$O(1) + O(n)$

$f(n) = 40 + 7n$

$f(n) \in O(n)$?

$f(n) = 20 + 5n + 3n^2 + 0.5n^3$

$f(n) \in O(n^3)$

storeValue (2, 131) O(1)

index, val

accessValue (2) O(1)

index

A[2]

↓

Base address + (index x Size of data type)

21 + (2 x 4)

29

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05 ADT

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Stack :

Data : < value, arrival time >

Collection of pairs

Operations :

create New (capacity, type)

create empty Stack with capacity

push (val) → add element with highest arrival time

Pop ( ) → return element with latest arrival time

isEmpty ( ) → yes/no

isFull ( ) → yes/no

- ✓ Access and remove top element only
- ✓ LIFO principle
- ✗ Size flexibility
- ✓ Stores same data type
- ~ Might not be available directly

top : element with latest arrival time

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