Alg420 Cheat Sheet

by cheatyboi via cheatography.com/55656/cs/14797/

Sieve of Erath

Cheatography

```
// Java program to print all primes
smaller than or equal to
// n using Sieve of Eratosthenes
class SieveOfEratosthenes
{
    void sieveOfEratosthenes(int n)
    ş
        // Create a boolean array
"prime[0..n]" and initialize
        // all entries it as true.
A value in prime[i] will
        // finally be false if i is
Not a prime, else true.
        boolean prime[] = new
boolean[n+1];
        for(int i=0;i<n;i++)</pre>
            prime[i] = true;
        for(int p = 2; p*p \leq n;
p++)
        ş
            // If prime[p] is not
changed, then it is a prime
            if(prime[p] == true)
            {
                // Update all
multiples of p
                for(int i = p*2; i
<= n; i += p)
                    prime[i] =
false:
        }
        // Print all prime numbers
        for(int i = 2; i <= n; i++)</pre>
        {
            if(prime[i] == true)
                System.out.print(i
 "");
        }
```

}

By cheatyboi

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3 Types of Decrease and Conquer Decrease by Decrease by variableconstant constant Size factor decrease insertion sort binary search Euclid's and bisection algoirthm method topolgical sorting exponentiation selection by squaring by partition algorithms for multiplication nim-like generating a la russe games

permutations, subsets

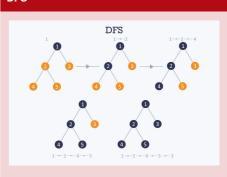
Summations

[sum(i, i=0n)
$\left[\begin{array}{c} n\left(n+1\right)\\ 2\end{array}\right]$
sum(i,i=1n)
$\frac{n(n+1)}{2}$
[sum(n,i=0n)
n(n+1)
$\begin{bmatrix} sum(2^{i}, i=0n-1) \\ 2^{n}-1 \end{bmatrix}$
$\begin{bmatrix} sum(2^{i}, i=0n-2) \\ 2^{n-1}-1 \end{bmatrix}$
$\begin{bmatrix} sum(i^2, i=0n) \\ \frac{n(2n+1)(n+1)}{6} \end{bmatrix}$
$\begin{bmatrix} \operatorname{sum}(i^3, i=0n) \\ \frac{n^2(n+1)^2}{4} \end{bmatrix}$

Complexities

Array Sorting Algorithms					
Ngorithm	Time Complexity			Space Complexity	
	Best	Average	Worst	Worst	
Quicksort	O(n log(n))	O(n log(n))	00**23	OClog(n))	
Mergeeort	OCn TopChDD	O(n log(n))	OCn log(n))	9003	
Timeort	0(1)	O(n log(n))	OCn TegCh33	9003	
Heepsort	OCn TopCn33	O(n log(n))	OCn TegCh33	0033	
Bubble Sort	0000	00#*23	00#231	0033	
Insertion Sort	0000	0(#*2)	0(002)	0(1)	
Selection Sort	0(**2)	0(#*2)	0(842)	0(1)	
Shell Sort	O(n)	0((nlap(n))/2)	0((nlag(n))/2)	0(1)	
Bucket Sort	O(r+k)	0(k)	0(++2)	(acre)	
Radix Sort	O(rk)	O(nk)	O(rk)	0(n+k)	

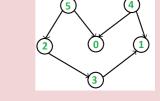
DFS





Brute-Force Problems				
Problem	Method	Complexity		
TSP	Exhaustive	N!		
KnapSack	Exhaustive	n*W		

Topological Sort



Order: 5,4,2,3,1,0

Genera	ate Permutations
Examp	le n=3:
start: 1	
12, 21	
123, 13	32, 312
321, 23	31, 213
finish	

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Euclidean Algorithm
Example:
GCD(270,192)
270/192 = 1 R 78
GCD(192, 78)
192/78 = 2 R 36
GCD(78,36)
78/36 = 2 R 6
GCD(36/6)
36/6 = 6 R0
since R = 0, 6 is GCD

Brute Force Pros vs Cons				
Pros	Cons			
Wide applicability	Rarely Yields Efficient			
Simple	Unacceptably Slow			
Reasonable Algorithms	Not as constructive as others			



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