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#### PRIMALITY TEST

- It is to determine if a given co number is a prime number or not.

### NAIVE APPROACH

TIME COMPLEXITY

O(N)

return false:

roturn false;

return true;

## BETTER APPROACH

-All divisors of a number N occur in pairs of (a,b) where

For example, factors of 12, = 1,2,3,4,6,12

Pairs => (1,12), (2,6), (3,4)

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STATEMENT: For a divisor pair(a,b) one of them lies below SQRT(N) and one lies above SQRT(N)

CASES:

- 3

0) Both A and B are below SQRT(N)

a ceptus be egitus

But then arb IN Hence, this is NOT TRUE.

o) Both A and B are above SORTIN)

as sqrt(N) b) sqrt(N)

But then, axb>N Hence, this NOT TRUE

0) One is above sqRT(N), one is below sqRT(N)

CASE A)

b< sqrt(n) -> 1< sqrt(n)/6

a = sqrt(N)\* (1+x) Hence a>sqrt(N) and vice-vous

THIS IS TRUE

Dai	e.						*					
						12		-		-	12	

For and bool is frome of

Time Complexity: 0(sopring)

return false;

for (int i=2; i+i =N; i+)

if (N1.i==0)

return trave; return false;

return Roses

antice sood on a toy A

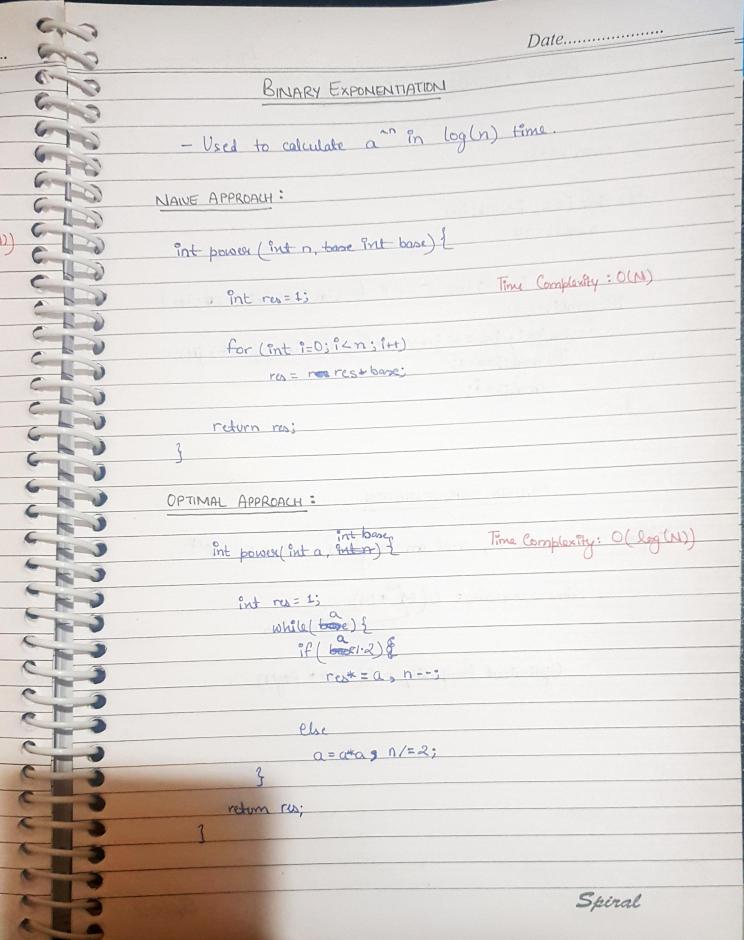
(n) type of contract

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10	SIEVE OR ERATOSTHENES	
6		
		149
66666	Preprocessing Time: O(log(logN))	
3)	Answer Quarry: 0(1)	
3)	Auxiliary space: O(N)	
3		7 (4)
3		
3)	bool num[101] fof;	
3		
1	num[0] = num[1] = 1;	
0	213111	
0	for (int i=2; i*i <n; i+)="" th="" {<=""><th>MARKS ALL</th></n;>	MARKS ALL
V		POWAT NUMBERA
1	For (int j=iki; j <ki 101;="" j+="1)&lt;/th"><th>As 'O' and Composite</th></ki>	As 'O' and Composite
J	num[j] = 1;	As '1'
3	3	HS =
3		
3	PRIME PACTORIZATION	
3		
)	void Find Princefact (int N) {	
1	JIME CON	IPLEXITY: O(N)
	for (inti=2; i<=N;i+){	1
	if (Ny.1 == 0) {	Prime
	int count =0;	
	while (N1.1 == 0) {	
	count ++;	
	N /= 1;	
	3	
	cout << i << "~" << count << end;	
	3	
	3	
- T. T. T. T.	S	piral

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OPTIMIZED APPROXH:	-
TC AL 9.	
If N is a composite number, then those is at loss I prine	
divisor of N below sort(N)-	P
	Fig.
For (int i=2; i+1<=N:i+) Time Complexity: 0 (sqrt(n)	)
2/11/10 2	9
$\inf_{\mathbf{n}} (\mathbf{n} + \mathbf{n}) = 0;$	9
.1917.19	
cnt++, N/= ?;	
	6)
cout << ° << " \" << cnt << end;	0
Compliance of the complete of	0
if(N>1)	6)
(N>1) (N>1) (COULCENCE)	9)
	97
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# PRIME FACTORIZATION USING SIEVE

int num [51];

# MATRIX EXPONENTIATION

- Given a matrix A, and an integer N, calculate AN

Optimized Complexity = O(MA3 + LogN)