\* Divide and conquer

+ Matrix multiplication

It we will use iterative algo then time complexity O(n3)

can ac achieve better ?

Yes, Osing der devide & conquer

what will be smaller problem size?

 $A = \begin{bmatrix} a_{11} & a_{12} & B = B_{11} & B_{12} & C = C_{11} & C_{12} \\ a_{21} & a_{22} & B_{21} & B_{22} & C_{21} & C_{22} \end{bmatrix}$ 

C11 = Q11 \* B11 + Q12 \* B21

C12 = 911 × B12 + 912 × B22

C21 = 921 xB11 + 922 B21 A = 010

C22 = 921 & B12 + 922 B22

Let's take 4x4 size

Here we are assuming that size each

matria is in 2<sup>n</sup>x2<sup>n</sup>

Example using Divide and Conquer

	16	A	Λ	(2)	vall a	20.	1100	341	11
A =	an	A11 912	913	914	100			613 6	-
		622			B =	621	622	b23 6.	29
	1931	932	933	az11	H 90	631	632	633 6	34
	La41 A	942	943	944		641	642	643 64	4
	A	21	Az	2	hounds	6		0 . 10	

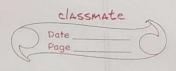
divide into n x n

^		_		<u> </u>	6×6~	
A =	A 11	Anz		Bu	B12	
612	10 1 25	312	B =		آفیر فرو	
- Cez )	A21	A 22	UB2)	B21	Bzz	
	L			_		

 $C = A \times B C_{11} = A_{11} \times B_{11} + A_{12} \times B_{12} = 21$   $C_{12} = A_{11} \times B_{12} + A_{12} \times B_{22} = 21$   $C_{21} = A_{21} \times B_{11} + A_{22} \times B_{21}$   $C_{22} = A_{21} \times B_{12} + A_{22} \times B_{22}$ 

total & matrix muliplication and 4 matrix Addition 3 n2

Recurrence J,  $n \leq 2$ Relation  $\sqrt{87(n/2)+n^2}$ ,  $n \gg 2$ 



· (0)	Strasser's Matrix Multiplication using
	Divide and Ou Conquer.
	Remission Pelabora
	- 11 12 R
	B A A B > 1 21 22 1
	B A A B 5 21 22 R  11 11 22 22 O 7
	P = (A11 + A22) (B11 + B22) Add diagonal value and then multiply
	- 0 = B <sub>11</sub> (A21 + A22) 7 for a pst put B + + B
	if B Thin formula
	-R = A11 (B12 - B22) will be in format A
	S = A 22 (B21 - B11)
	$T = B \left( A_{11} + A_{12} \right)$
	2 Con De Daith using SOT
	U = (Az 1 - A 11) (B, + B, z) tare bracket value chang variable
	( Bart Brz ) (A12 - A22 ) Same as U
1	( Bz1 + Bz2) (A12 - A22) Same as U
	(8+0-7+-=
	C-P+SA-T+0
	C = R + T = RAT (Raddinon with T)
	$C_{12} = R + R + R + R + R + R + R + R + R + R$
	for c2; dersenent value of (12
	C22 = P + R2 - Q + U 18 = 188 ) 0 A = 2
	(++2)E =
	38 = 36

Recurrence Relation

$$T(n) = \int 1$$
,  $n=1$   
 $7T(h/2) + h^2$ ,  $n>1$ 

Example:

$$p = (A_{11} + A_{22}) * (B_{11} + B_{22})$$

$$= (S+3)(-7+9)$$

$$= 8 * 2 = 16$$

$$0 = B_{11} (A_{21} + A_{22})$$
  
= -7 (-4+3)

$$R = A_{11}(6-9) A_{11}(B_{12}-B_{22})$$

$$= 5(6-9)$$

$$= -15$$

$$S = A_{22} (B_{21} - B_{11})$$

$$= 3(5+7)$$

$$= 36$$

$$0 = (A_{21} - A_{11}) (B_{11} + B_{12})$$

$$= (-4 - 5) (-7 + 46)$$

$$= (-9)(-1) = 9$$

$$0 = (B_{21} + B_{22}) (A_{12} - A_{22})$$

$$= (S+9) (G-3)$$

$$= (14)(3) = 42$$

$$C_{II} = P + S - T + U = 16 + 36 - 99 + 42 = -5$$

$$C_{22} = P + P^2 - CO + U = 16 + (-15) - 7 + 9 = 3$$