

COP 3502 8/29/25-

- 1) Schedule { M - NO CLASS
W - QUIZ
F - DON'T COME, WATCH ZOOM
- 2) P1, P2 both posted
- 3) Recursion

✓ Fib
✓ Tip chart
✓ factorial
✓ power

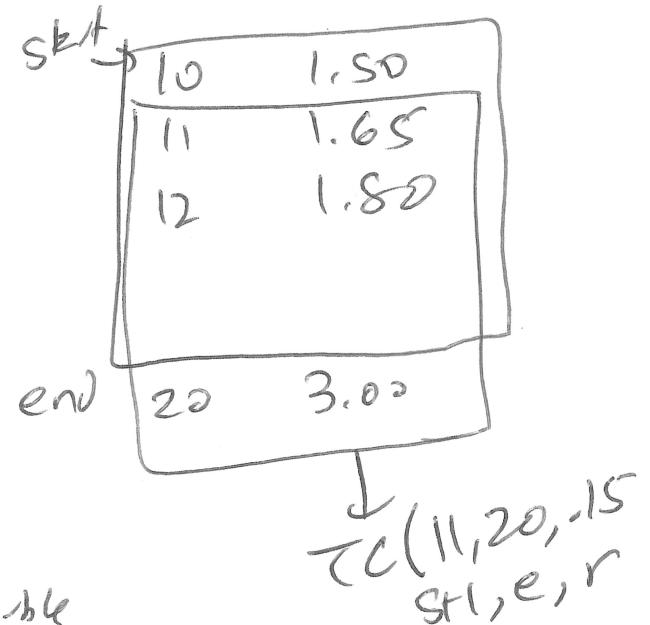
✓ fast modder expo
- binary search

- towers of hanoi
int int double

TC(start, end, tiprek)

1. Print now start

2. TC(start+1, end, tiprek)



$$n! = (1 \times 2 \times 3 \times \dots \times (n-1)) \times n$$

$$= (n-1)! \times n \quad (\text{fact}(n) = \text{fact}(n-1) \times n)$$

$$0! = 1, \quad 1! = 1$$

$$b^e = b^{\boxed{e-1}} \times \overbrace{b}^{1}$$

$$b^x \cdot b^y = b^{x+y}$$

↑
Alg rule

$$\text{power}(b, e) = \text{power}(b, e-1) * b$$

$$b^e = \boxed{b^{e/2}} \times \boxed{b^{e/2}}$$

If e is even

Since same intermediate rec
call and square it!
NOT PRACTICAL FOR LARGE
EXP BECAUSE ANSWER LARGE

Ans what is $b^e \bmod m$?

MODULAR EXPONENTIATION.

MAX INTERMEDIATE CALC $\leq m^2$
SPEED RUN TIME

if e is even

ans=fastmodexpo(b, e/2, m)

return (ans*ans) % m;

Towers (START, END, N)

In order to move disk n,

I must move all n-1 disks
above to a ~~to~~ 2nd tallest tower

TOWERS PROBLEM