

$s \text{ of digits}(n)$

$$\begin{cases} n == 0 & \rightarrow 0 \\ \text{return } n \% 10 + s \text{ of digits}(n / 10); \end{cases}$$

Recursion Tree {
 m(1234) }
 (DP) {
 $4 + s(123)$
 $4 + 3 + s(12)$
 $4 + 3 + 2 + s(1)$
 $4 + 3 + 2 + 1 + s(0) = 10$

$CD(n)$
 $n == 0 \rightarrow r \rightarrow 0 \rightarrow 0$
 $\text{return } 1 + CD(m / 10);$

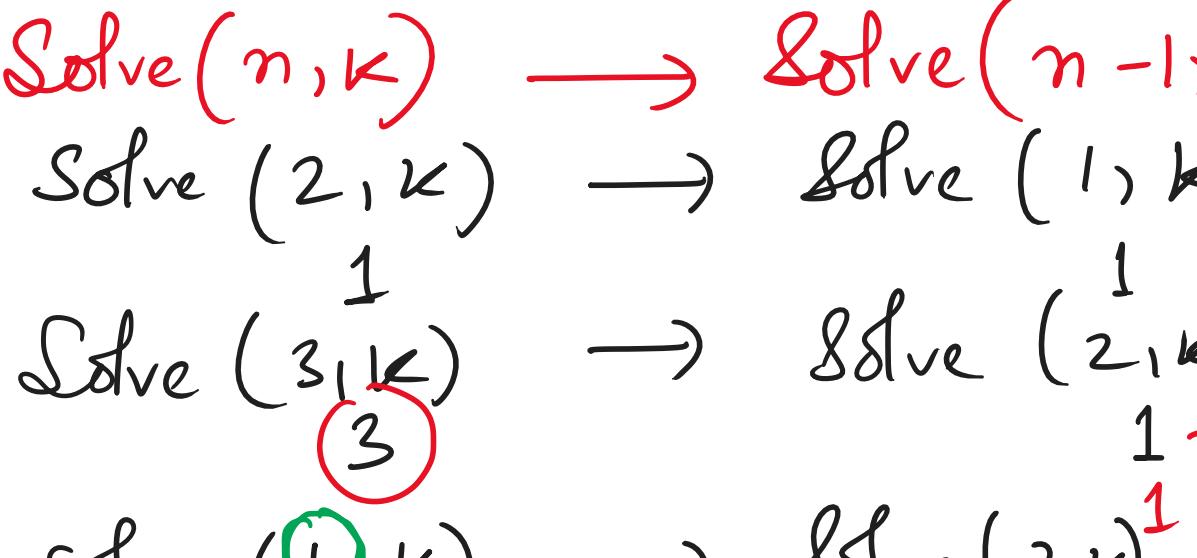
m(1234)

Tree {
 $CD(1234)$
 $1 + (CD(123))$
 $1 + 1 + CD(12)$
 $1 + 1 + 1 + CD(1)$
 $1 + 1 + 1 + 1 + CD(0) + 0$
 power (x^n) {
 (x, n) }
 if $n == 0$ {
 $\text{return } 1 \rightarrow ①$
 $\text{return } x * p(x, n - 1);$ }
 n multiplied
 (↑ change)
 exp controlling
 base getting
 $32 \times 1 = (32)$
 $2 \times P(2, 4)$
 $2 \times 2 \times (2, 3)$
 $2 \times 2 \times 2 \times (2, 2)$
 $2 \times 2 \times 2 \times 2 \times (2, 1)$
 $2 \times 2 \times 2 \times 2 \times 2 \times (2, 0)$

Fib Series. $0, 1, 1, 2, 3, 5, 8, 13, 21, \dots$

$f(0) = 0$
 $f(1) = 1$
 $f(2) = f(1) + f(0)$
 $f(3) = f(2) + f(1)$
 $f(n) = f(n-1) + f(n-2)$

{ Recursion Tree }



* Code Help → Love Babbar C++ / Hindi
 * Take You Forward → Striver C++ / English
 * Java → Kunal Kushwaha (Java)

(Abdul Bari) ⇒ (pseudo code)

* Free Code Camp
 * Chai Aur Code [Development]
 * Traversy Media (W3schools)
 * Tech With Tim
 * Telusko

8 LPA 3-S LPA n-S LPA 18 LPA

(1823) LC Find the Winner of the circular game

$w = 3$ ($n = 5, k = 2$) Josephus Problem $k = 2$



| n | w |
|---|---|
| 1 | 1 |
| 2 | 1 |
| 3 | 3 |
| 4 | 1 |
| 5 | 3 |
| 6 | 5 |

$Solve(n, k) \rightarrow Solve(n-1, k)$
 $Solve(2, k) \rightarrow Solve(1, k)$
 $Solve(3, k) \rightarrow Solve(2, k)$
 $Solve(4, k) \rightarrow Solve(3, k)$
 $Solve(5, k) \rightarrow S(4, k) = 5 \% 4 = 1$
 $Solve(6, k) \rightarrow S(5, k) = 5 \% 4 = 1$

$Solve(n, k) = [Solve(n-1, k) + k] \% n$

$n=1 \quad k - count = 0$
 $n=2 \quad 1$
 $n=3 \quad 1, 2$
 $n=4 \quad 1, 2, 3$
 $n=5 \quad 1, 2, 3, 4$
 $n=6 \quad 1, 2, 3, 4, 5$

cyclic arrangement ↳ recursion

% n normalization

1 modulo

$S \cdot 1, S = 1$

$2 \cdot 1, S = 2$

$3 \cdot 1, S = 0$

$4 \cdot 1, S = 1$

$5 \cdot 1, S = 2$

$6 \cdot 1, S = 1$

$7 \cdot 1, S = 2$

$8 \cdot 1, S = 1$

$9 \cdot 1, S = 2$

$10 \cdot 1, S = 1$

$11 \cdot 1, S = 2$

$12 \cdot 1, S = 1$

$13 \cdot 1, S = 2$

$14 \cdot 1, S = 1$

$15 \cdot 1, S = 2$

$16 \cdot 1, S = 1$

$17 \cdot 1, S = 2$

$18 \cdot 1, S = 1$

$19 \cdot 1, S = 2$

$20 \cdot 1, S = 1$

$21 \cdot 1, S = 2$

$22 \cdot 1, S = 1$

$23 \cdot 1, S = 2$

$24 \cdot 1, S = 1$

$25 \cdot 1, S = 2$

$26 \cdot 1, S = 1$

$27 \cdot 1, S = 2$

$28 \cdot 1, S = 1$

$29 \cdot 1, S = 2$

$30 \cdot 1, S = 1$

$31 \cdot 1, S = 2$

$32 \cdot 1, S = 1$

$33 \cdot 1, S = 2$

$34 \cdot 1, S = 1$

$35 \cdot 1, S = 2$

$36 \cdot 1, S = 1$

$37 \cdot 1, S = 2$

$38 \cdot 1, S = 1$

$39 \cdot 1, S = 2$

$40 \cdot 1, S = 1$

$41 \cdot 1, S = 2$

$42 \cdot 1, S = 1$

$43 \cdot 1, S = 2$

$44 \cdot 1, S = 1$

$45 \cdot 1, S = 2$

$46 \cdot 1, S = 1$

$47 \cdot 1, S = 2$

$48 \cdot 1, S = 1$

$49 \cdot 1, S = 2$

$50 \cdot 1, S = 1$

$51 \cdot 1, S = 2$

$52 \cdot 1, S = 1$

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$99 \cdot 1, S = 2$

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$102 \cdot 1, S = 1$

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$104 \cdot 1, S = 1$

$105 \cdot 1, S = 2$

$106 \cdot 1, S = 1$

$107 \cdot 1, S = 2$

$108 \cdot 1, S = 1$

$109 \cdot 1, S = 2$

$110 \cdot 1, S = 1$