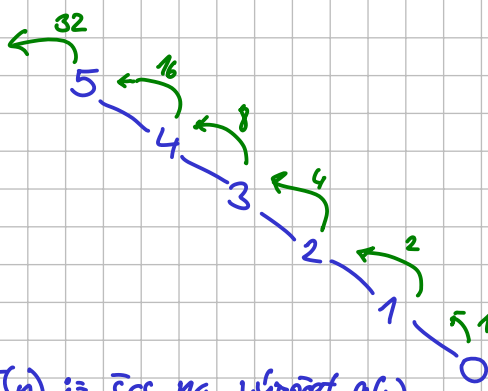


$$2^n = 2 \cdot \underbrace{2 \cdot \dots \cdot 2}_{n-1} \cdot 2$$

$$2^n = 2 \cdot 2^{n-1}$$

$$[2^0 = 1$$

Jinak: $2^n = 2^{n-1} + 2^{n-1}$

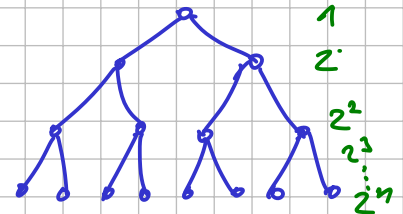


$T(n) :=$ čas na výpočet $g(n)$

$$T(n) = 2T(n-1) + 1$$

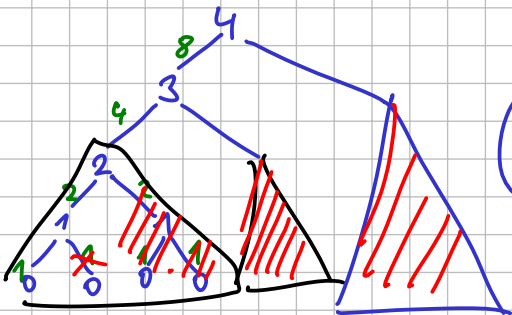
$$T(0) = 1$$

$$\rightarrow T(n) \geq 2^n$$



1 vrchol: $O(1)$ času

$$\begin{aligned} \# \text{ vrcholů} &= 2^0 + 2^1 + \dots + 2^{n-1} + 2^n \\ &= 2^{n+1} - 1 \approx 2^n \\ &= \frac{11\dots1}{n+1} \quad \frac{100000-1}{n+1} = \frac{01\dots1}{n+1} \end{aligned}$$



$$x \cdot y = 2x + x \cdot (y-2)$$

$$x \cdot y = x + x \cdot (y-1)$$

$$x \cdot 0 = 0$$

} čas $O(y)$

$$x \cdot 16$$

$$x \cdot 2 = x + x$$

$$x \cdot 2 \cdot 2 \cdot 2$$

$$[x \cdot 4 = x \cdot 2 + x \cdot 2$$

$$x \cdot 8 = x \cdot 4 + x \cdot 4$$

$$x \cdot 16 = x \cdot 8 + x \cdot 8$$

je-li y sudé: $x \cdot y = (x \cdot \frac{y}{2}) + (x \cdot \frac{y}{2})$

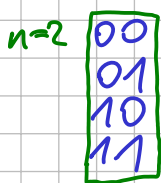
liché: $x \cdot y = x \cdot (y-1) + x$

čas: $O(\log y)$

$$x \cdot 17 = x \cdot 16 + x$$

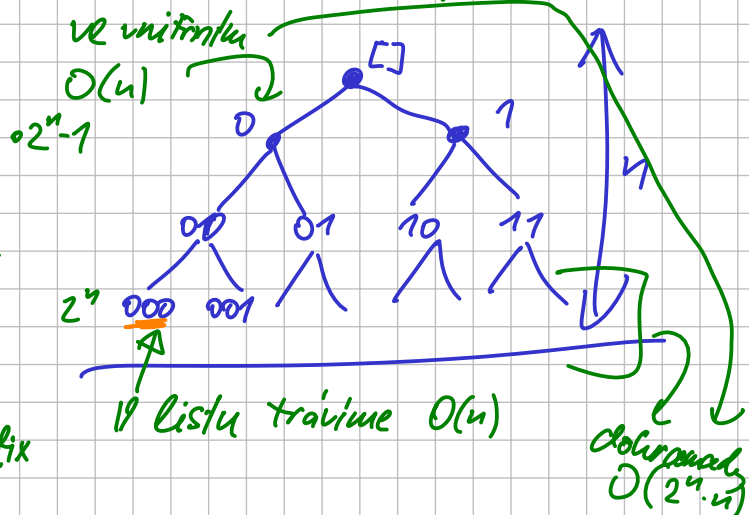
$$x \cdot 20$$

Generování posloupnosti 0 a 1 délky n



} 2^n posloupností

gen. posl. délky n začínající na 2 prefix



$$\binom{n}{k} = \binom{n}{n-k}$$

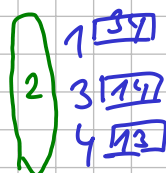
lexikografické pořadí

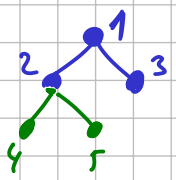
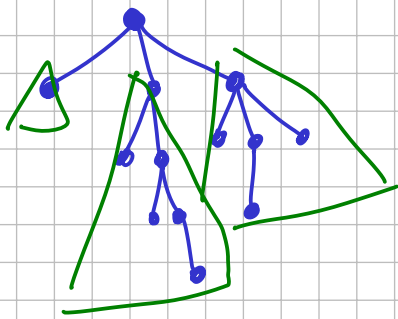
• Jen ty posloupnosti, ve kterých je právě k jedniček

• Permutace $\{1, \dots, n\}$

n=4

1234	2134	3124	4123
1243	2143	3142	4132
1324	2314	3214	4213
1342	2341	3241	4231
1423	2413	3412	4312
1432	2431	3421	4321





$(1, [(2, \square), (3, \square)])$

$[(4, \square), (5, \square)]$

1
 $\hookrightarrow \text{sym}_1$
 $\hookrightarrow \text{sym}_2$
 \vdots
 $\hookrightarrow \text{sym}_k$



$5 * 1 + 3 * (2 + 4)$

sys. set recursion limit()

$3 + 7 * x$

