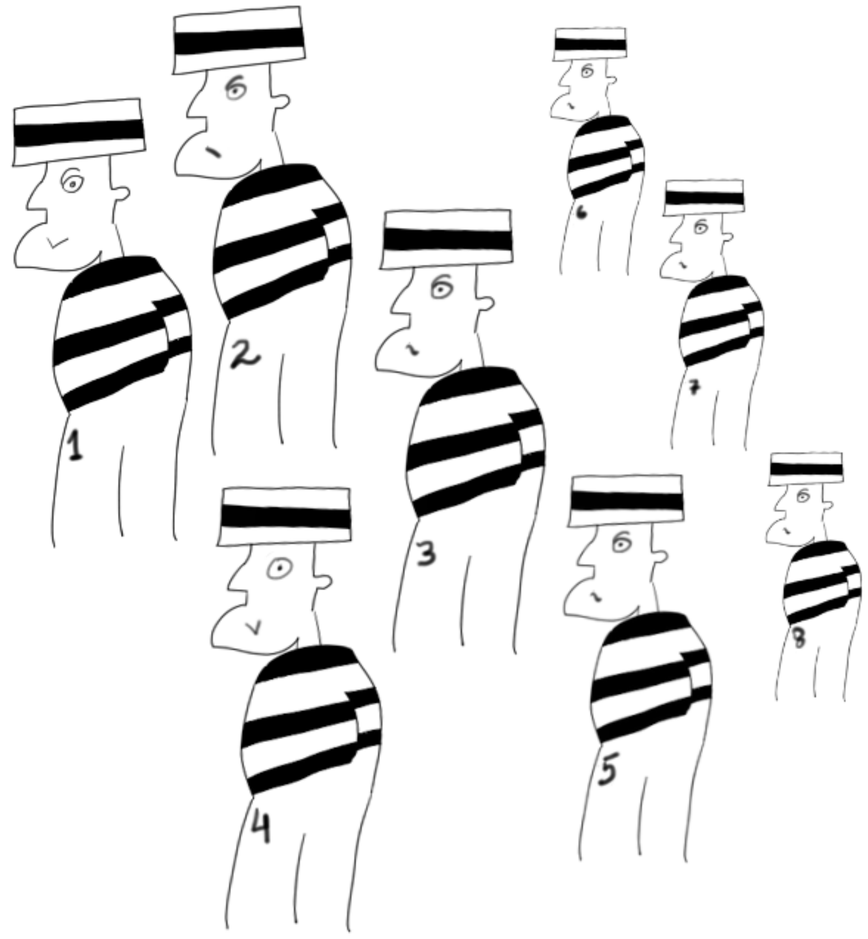
O problema do prisioneiro viajante

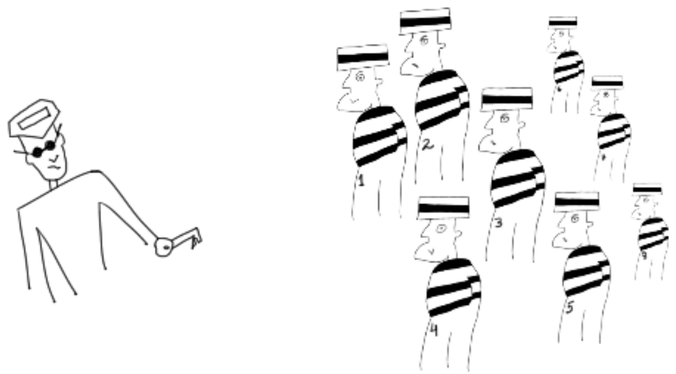
Seminário
de coisas legais

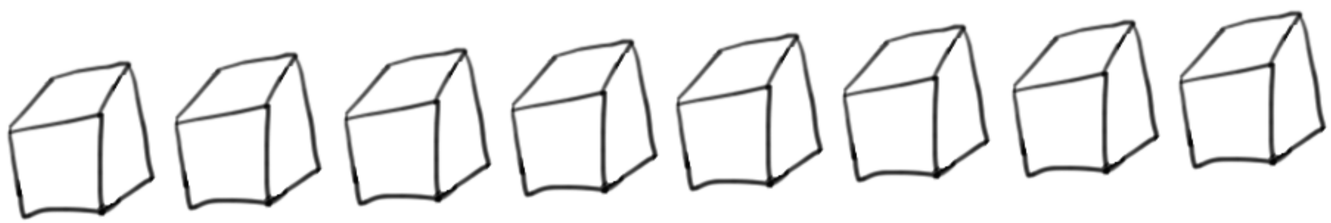
8/11/2013

Do you wanna play a game ?



Do you wanna play a game ?





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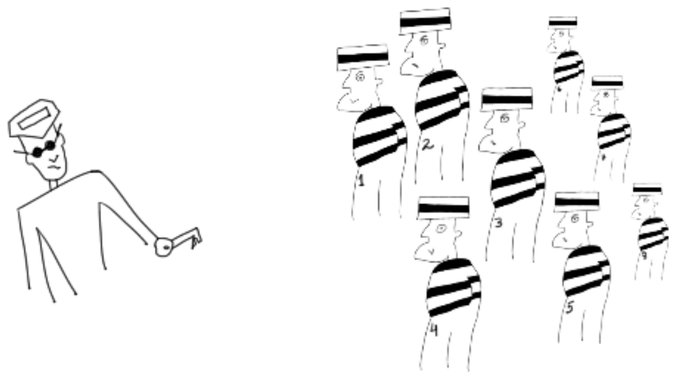

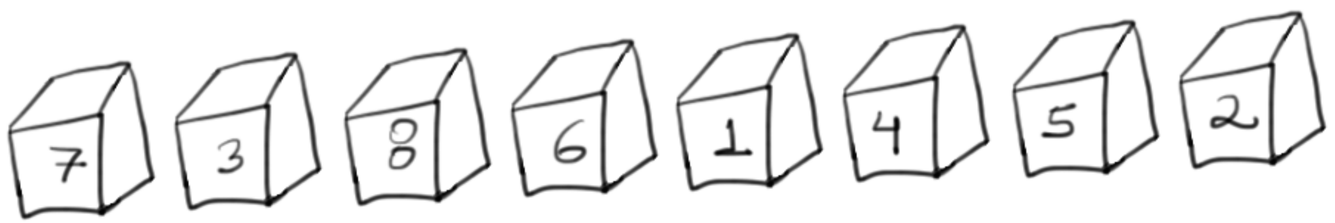

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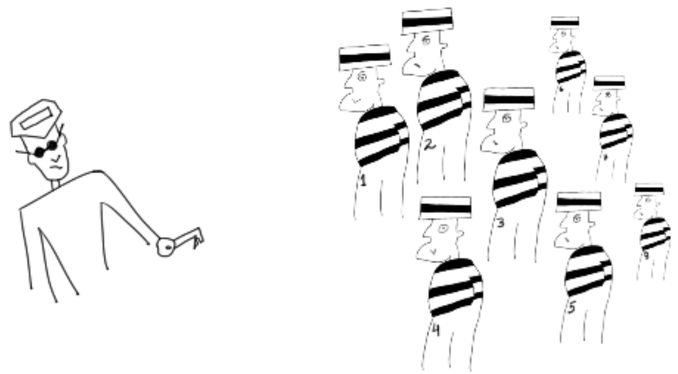
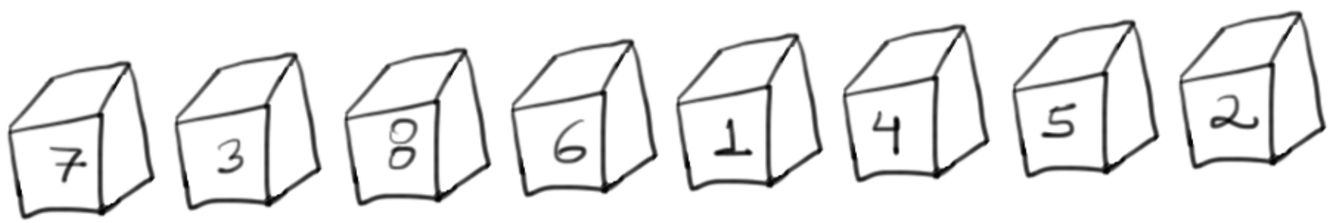
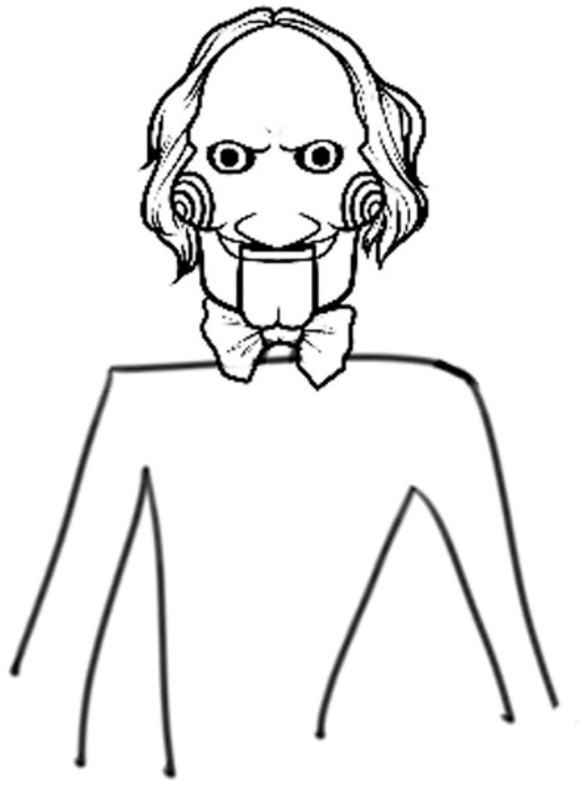


Regras:

* Cada prisioneiro escolhe 4 (n/2) caixas
* Se todos encontrarem seus números, todos livres



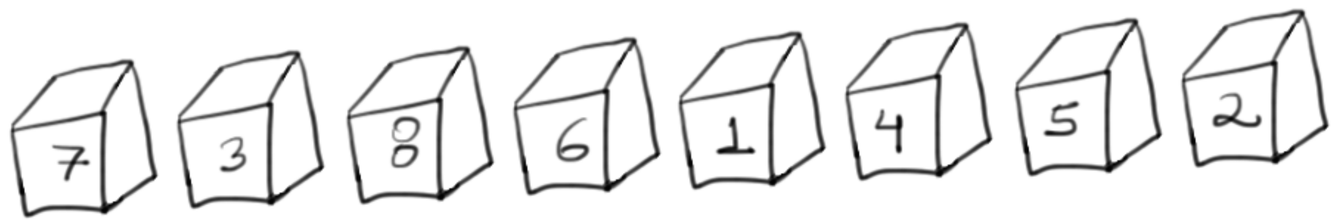
Caso contrário...



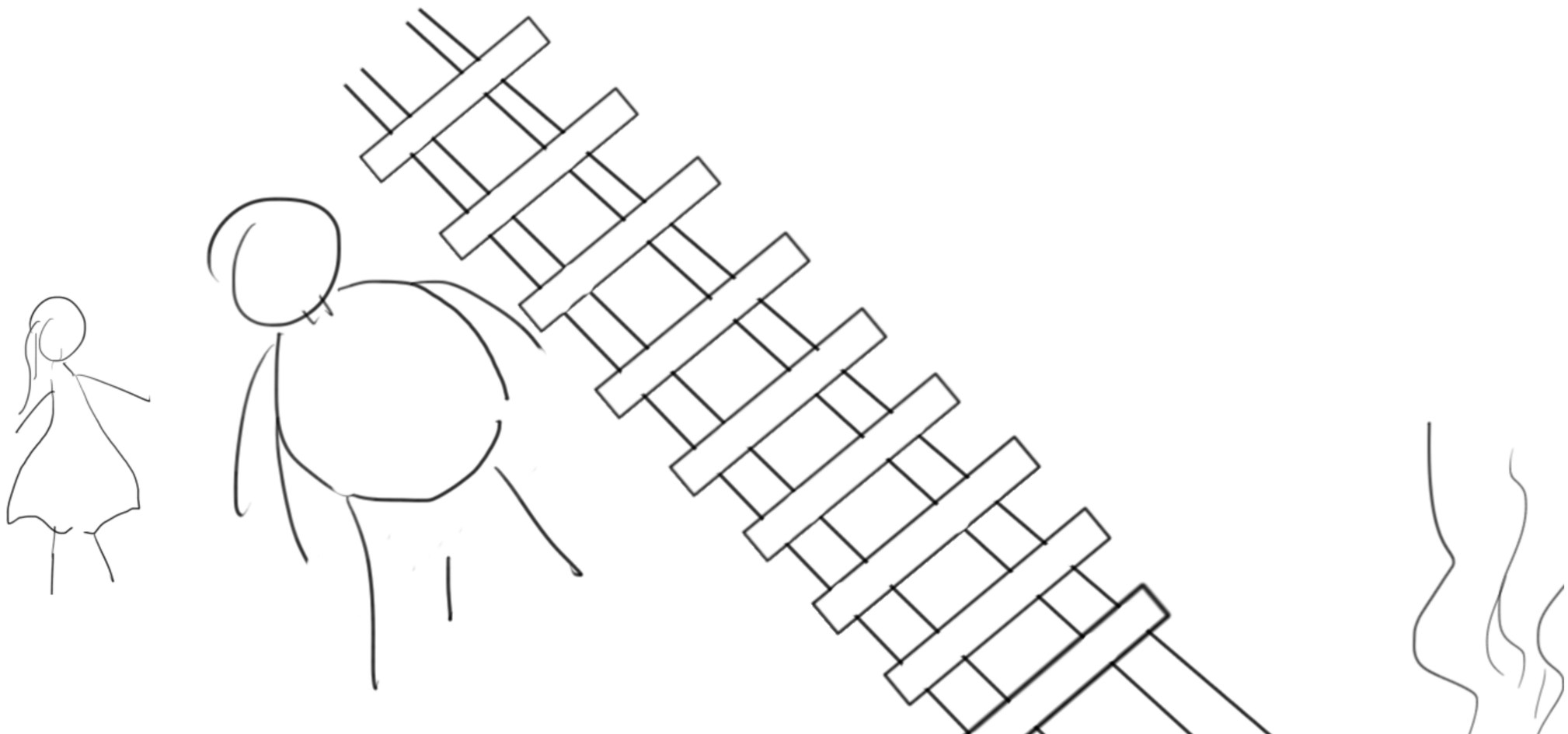
Que dilema ?

1 prisioneiro) $\frac{4}{8} = 1/2$

8 prisioneiros) $(1/2)^8 < 0{,}4\%$



E o gordo ?



O problema do caixeiro viajante

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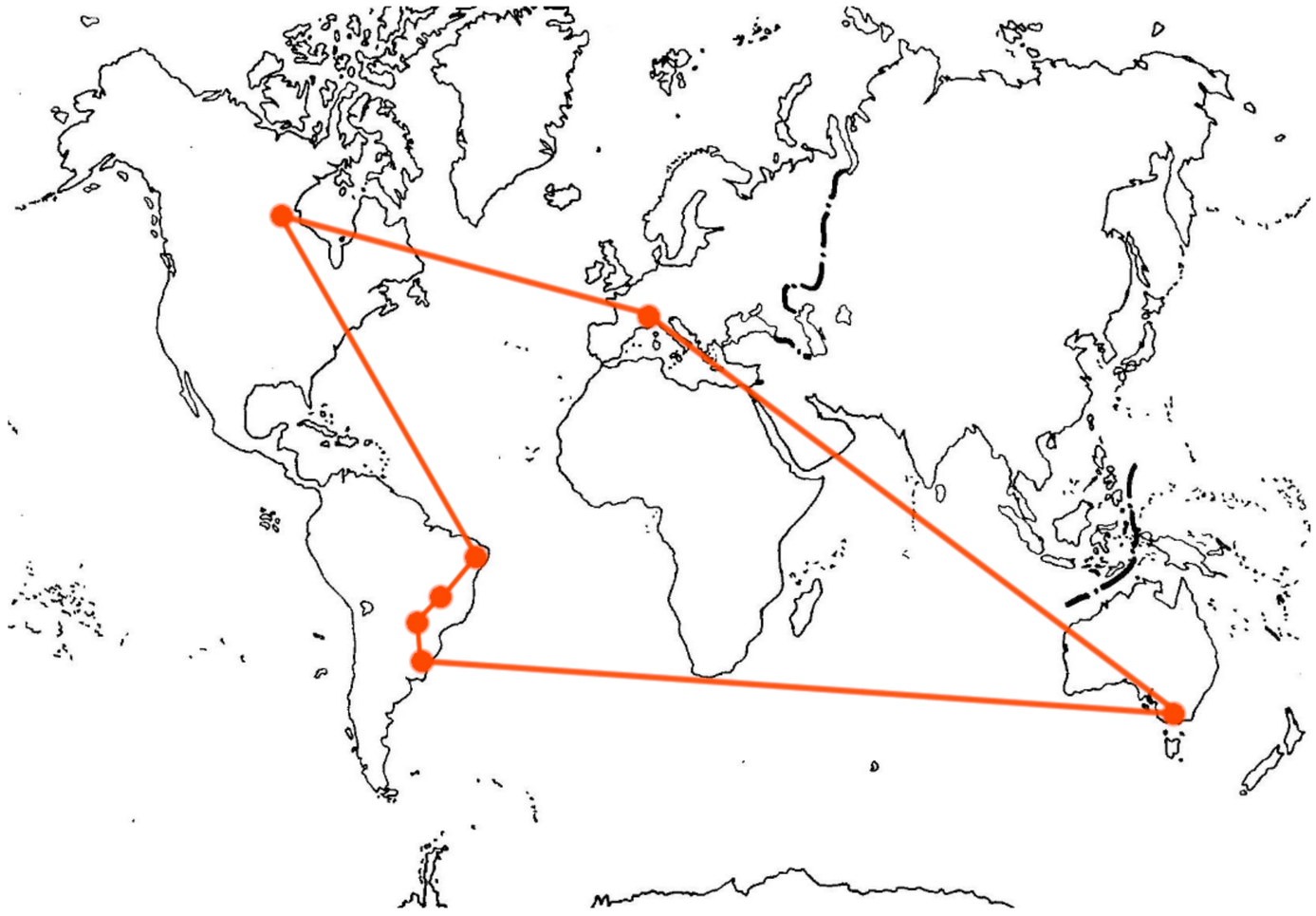
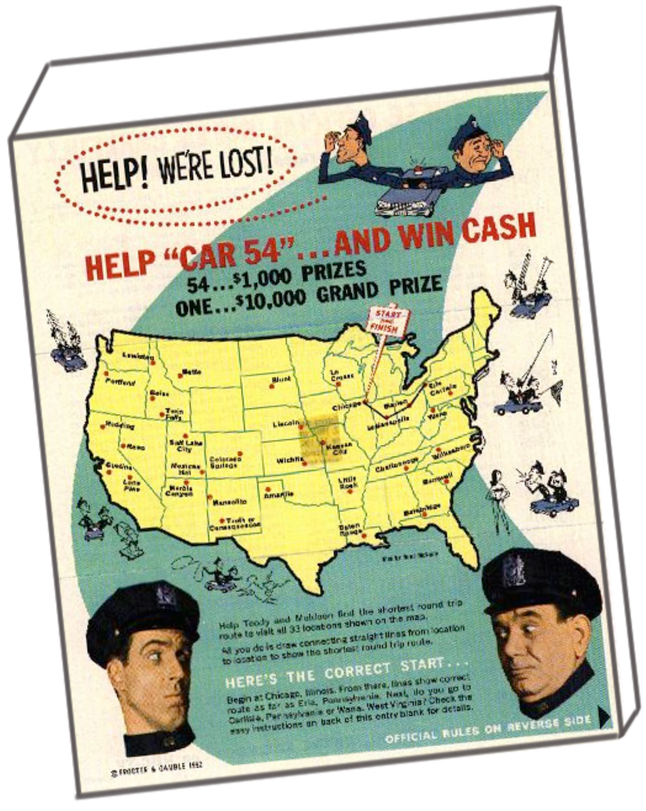
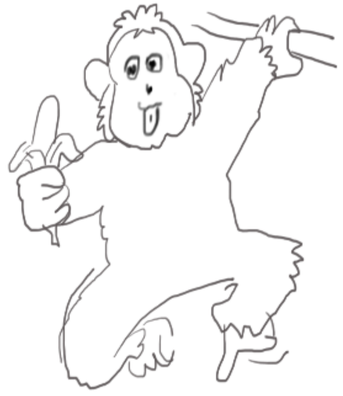


Um problema curioso

Um problema simples



Um problema muito simples



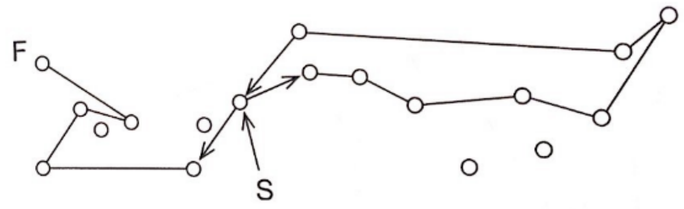


Figure 1.40 Chimpanzee tour (Bido).

Um problema muito muito simples

Um problema muito muito simples

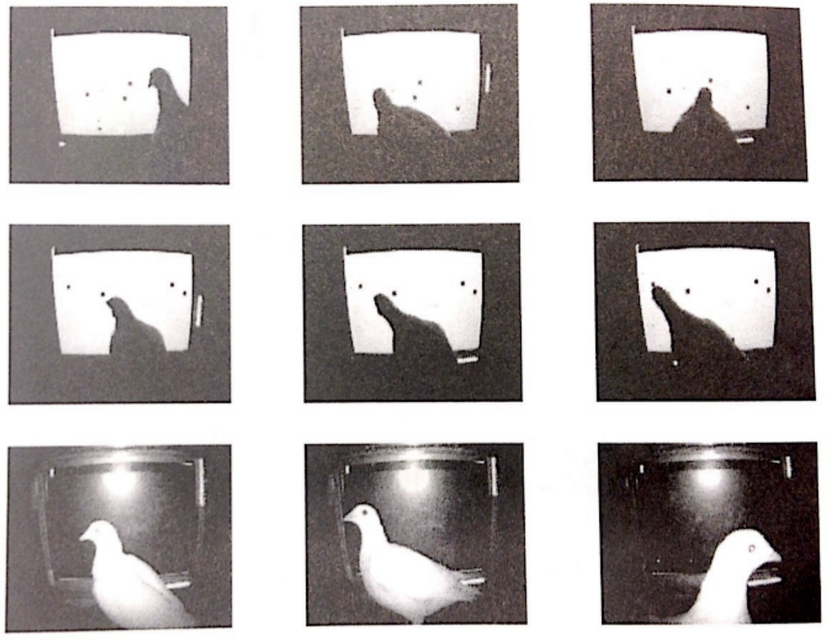


Figure 1.41 Pigeon solving a TSP. Images courtesy of Brett Gibson.

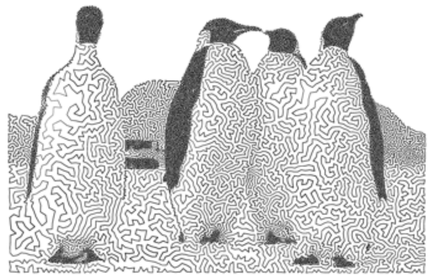
Um amor de problema

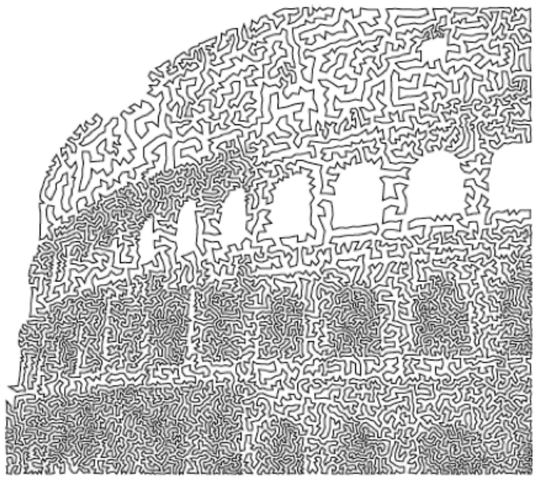
Um amor de problema

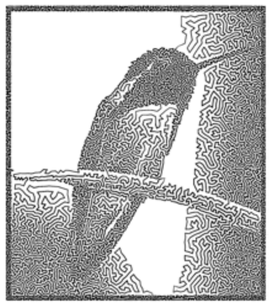
Table 1.3 Average tour quality found by participants. van Rooij et al. [485].

Number of Cities	7-Year-Olds	12-Year-Olds	Adult
5	3.8%	2.5%	1.7%
10	5.8%	3.4%	1.7%
15	9.4%	5.0%	2.7%

Um amor de problema







Um amor de problema

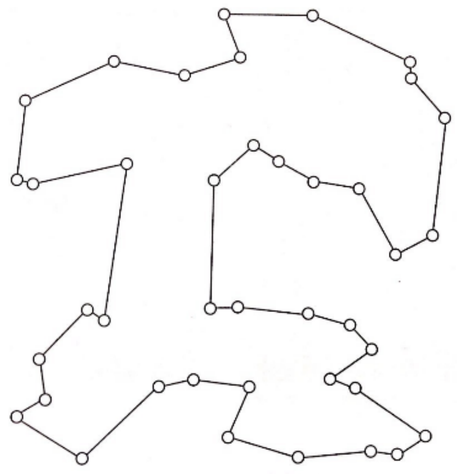
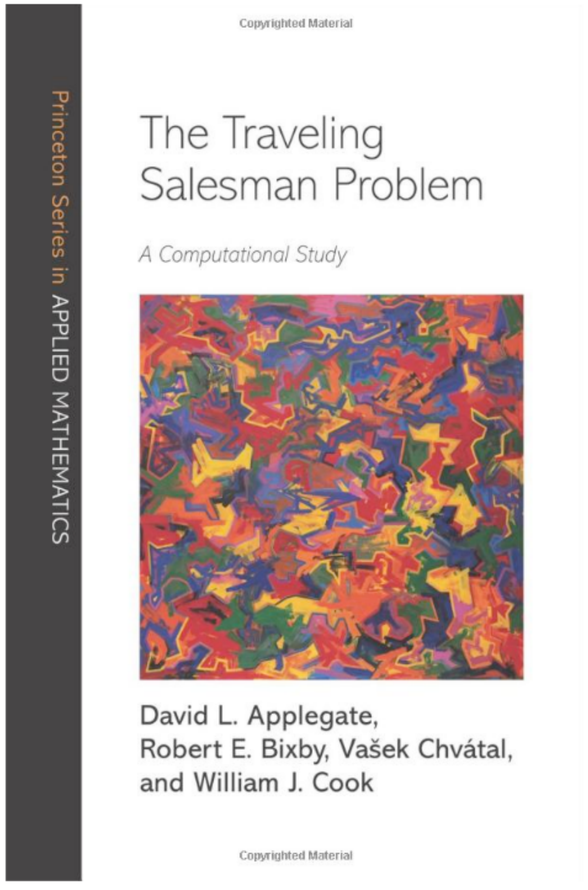
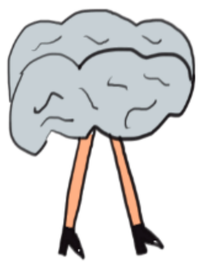


Figure 1.32 Tour found by member of the Gestalt group. Vickers et al. [539].

Um amor de problema



Um problema complicado



Um problema complicado

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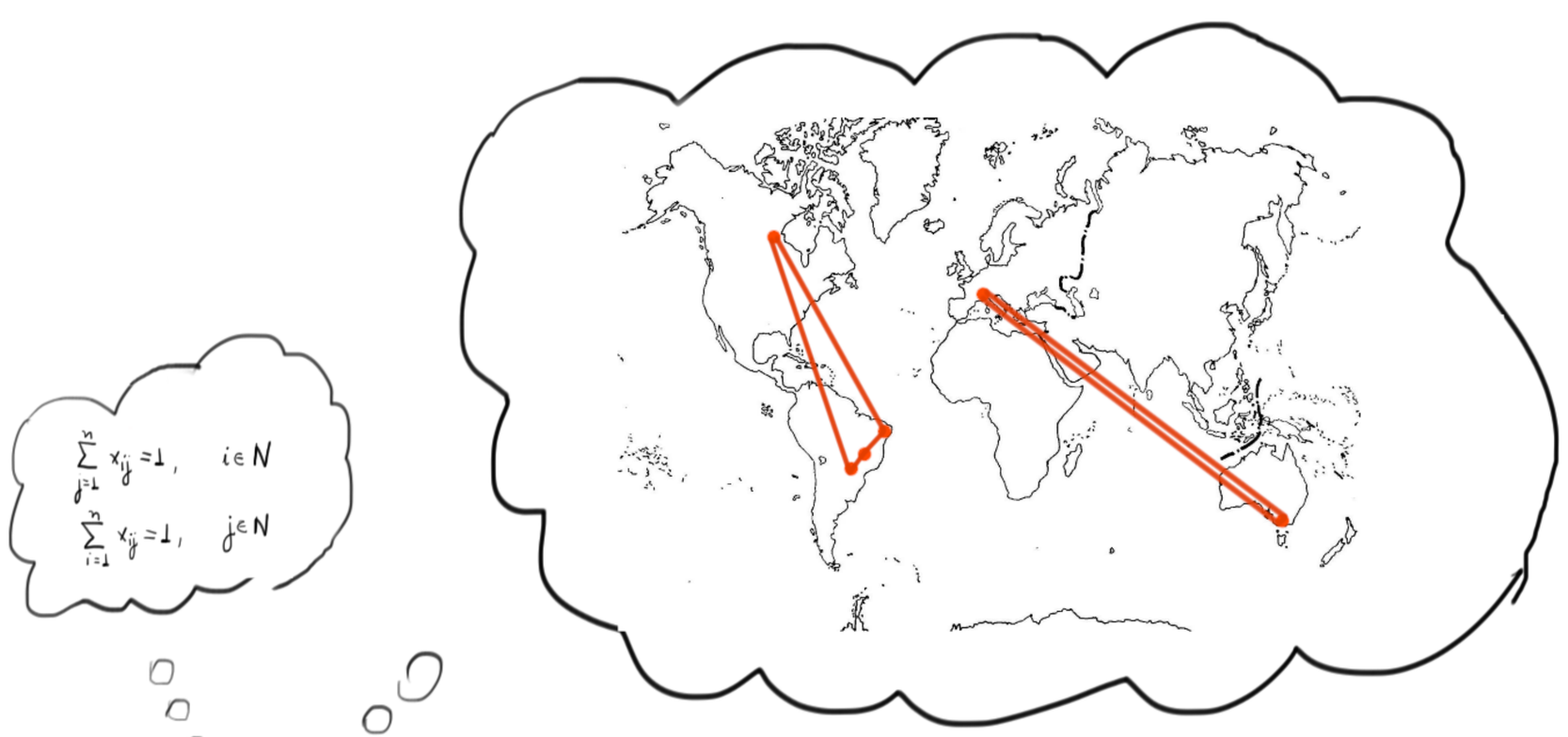
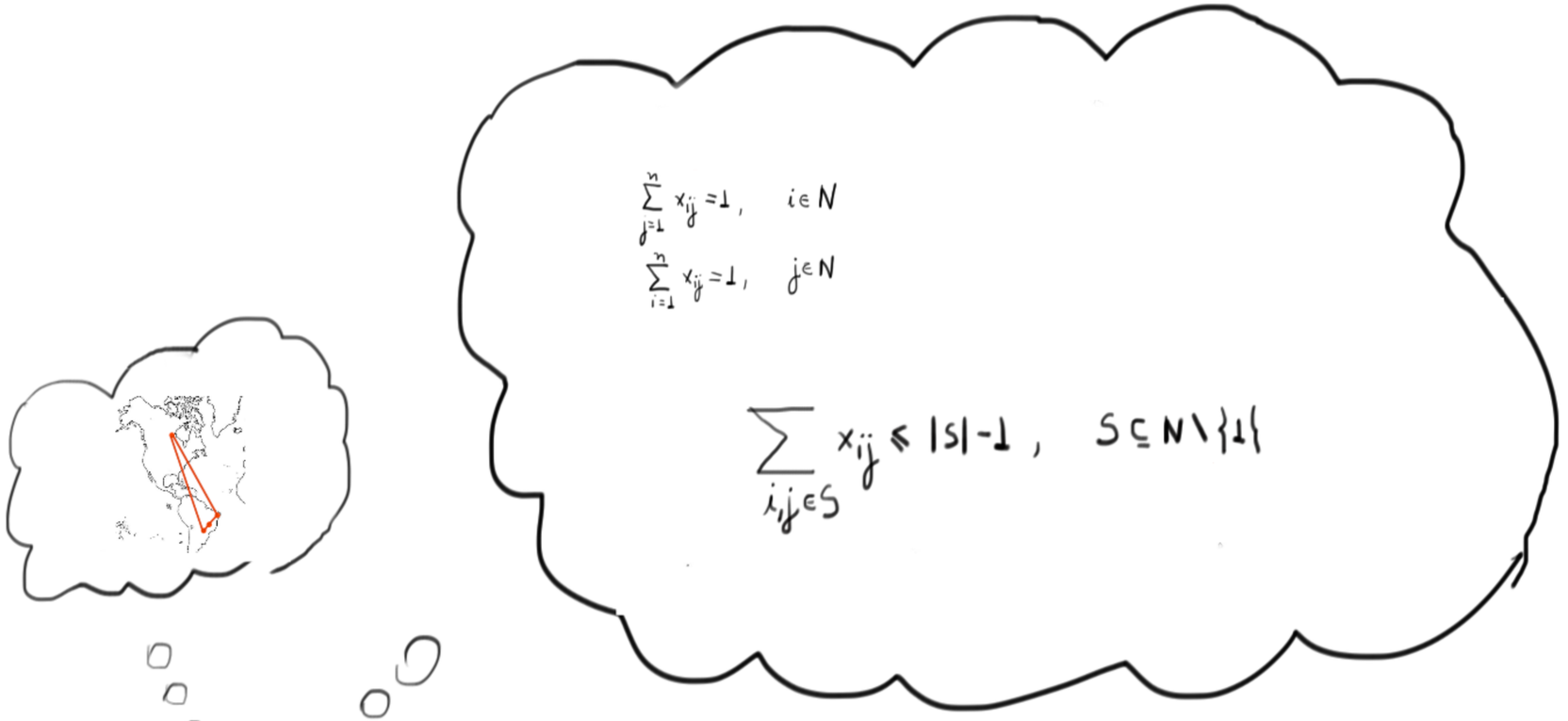
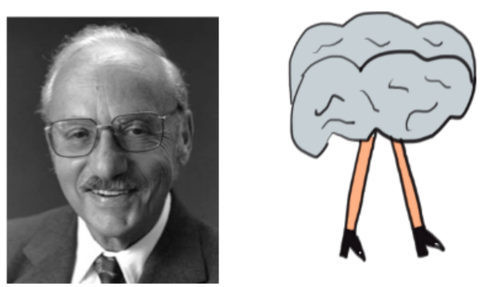


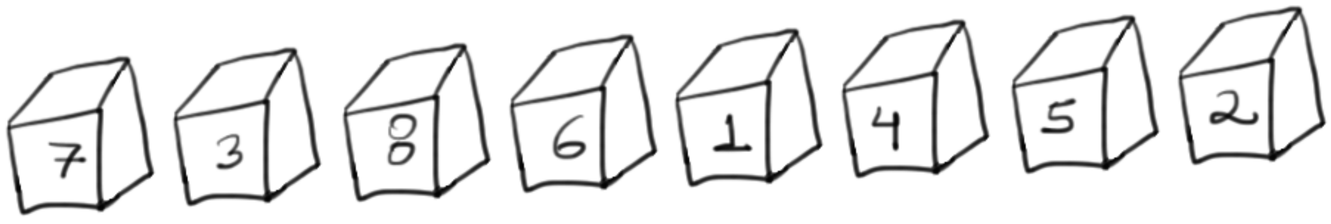
Um problema complicado





+ Fulkerson & Johnson (1954)

E daí?



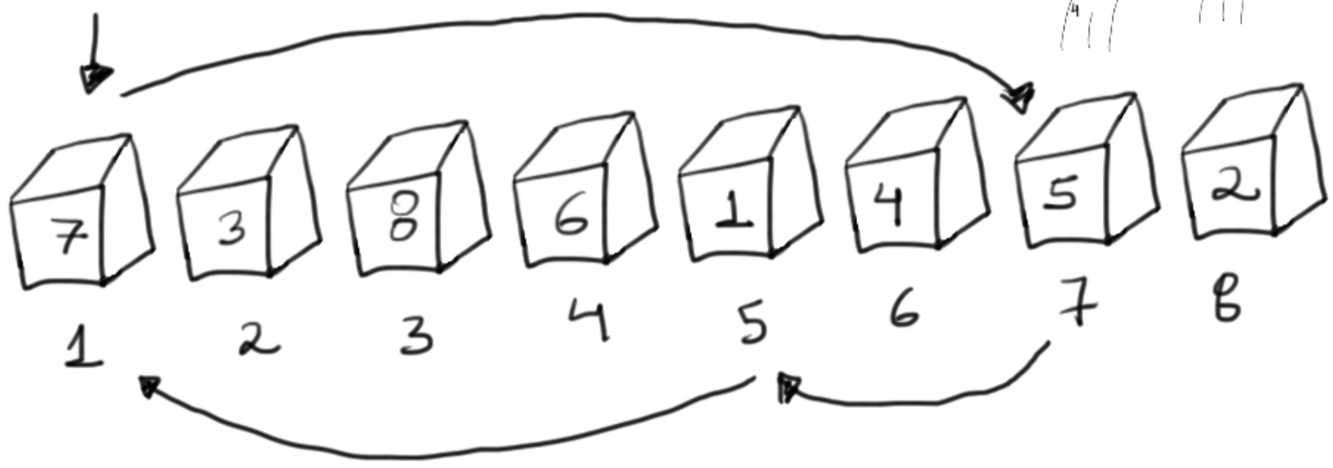
Plano


Estratégia:
* numere as caixas em ordem
* olhe o número dentro da sua caixa e siga para esta caixa.
7
3
8
6
1
4
5
2

Plano

Encontrou seu número.

Por quê ?



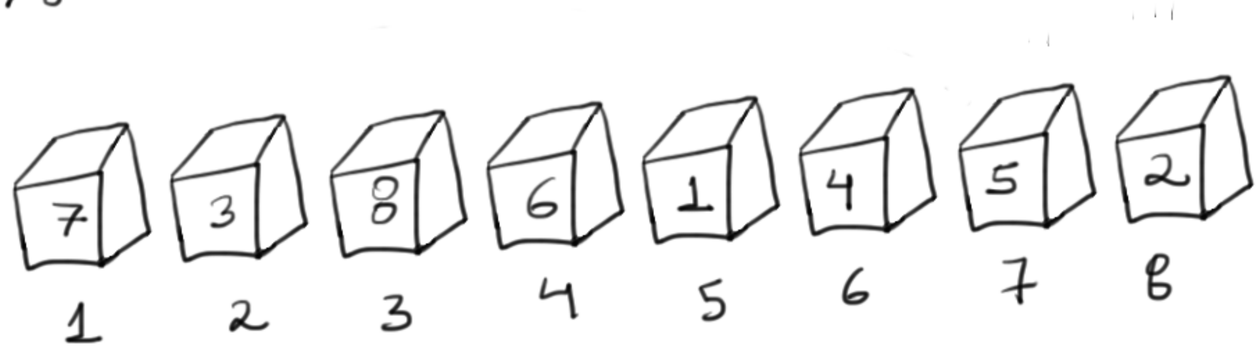
de configurações c/ ciclos de tamanho 5)

$$\binom{8}{5} \cdot (5-1)! \cdot 3! = \frac{8!}{5!\,3!} \cdot 4! \cdot 3! = \frac{8!}{5}$$

6) $8!/6$

7) $8!/8$

8) $8!/8$



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6) $8!/6$

7) $8!/8$

8) $8!/8$

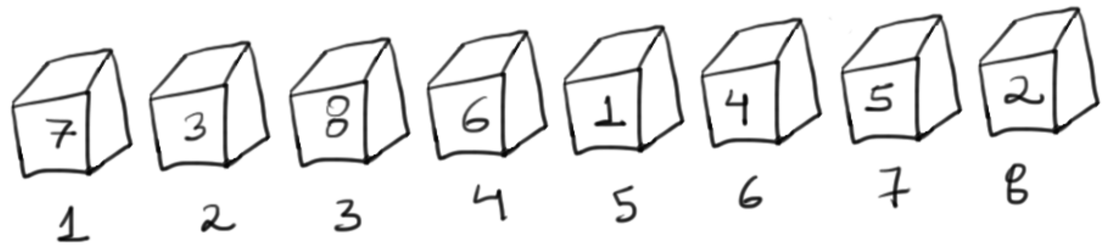
total de configurações

$8!$

Probabilidade da estratégia falhar:

$$\frac{\frac{8!}{5} + \frac{8!}{6} + \frac{8!}{7} + \frac{8!}{8}}{8!} =$$

$$\frac{1}{5} + \frac{1}{6} + \frac{1}{7} + \frac{1}{8} \simeq 63\%$$

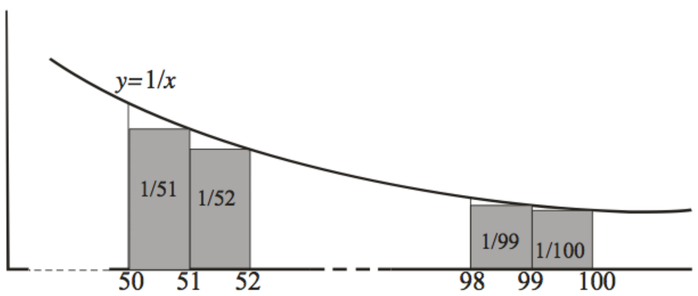


37% >> 0,3%

de sucesso

Para 100 prisioneiros:

$$\frac{1}{51} + \frac{1}{52} + \frac{1}{53} + \dots + \frac{1}{100}$$



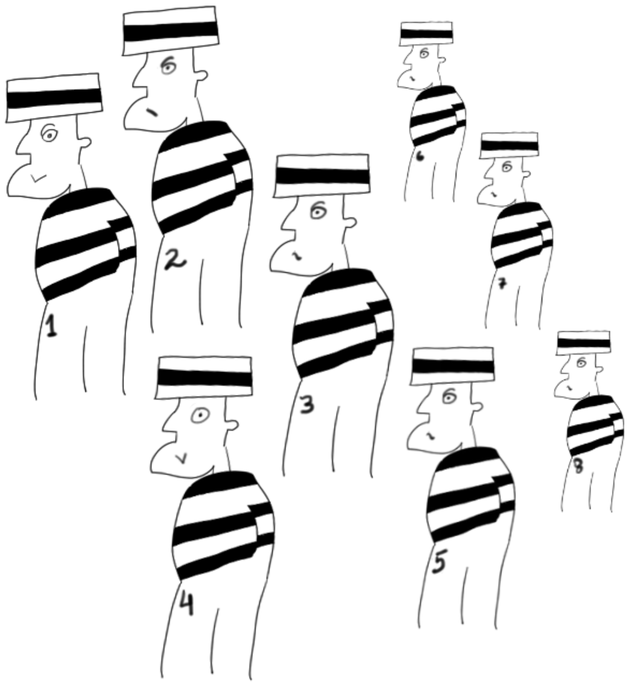
limitado por:

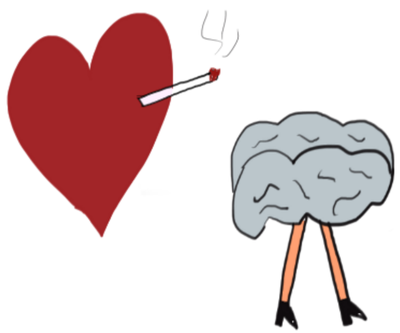
$$\int_{50}^{100} 1/x \, dx = \ln 100 - \ln 50 = \ln 2$$

$$< 70\%$$

$\rightarrow$ Sucesso $> 30\% \ggg \left(\frac{1}{2}\right)^{100}$

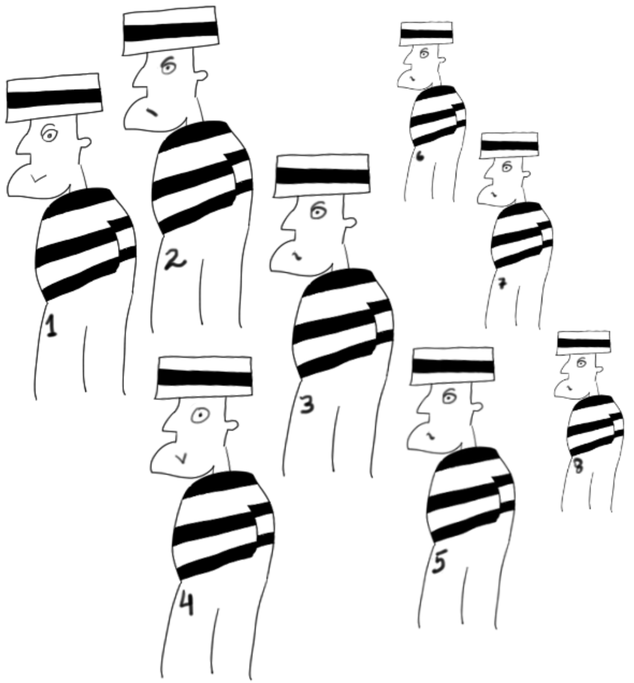
E aí?

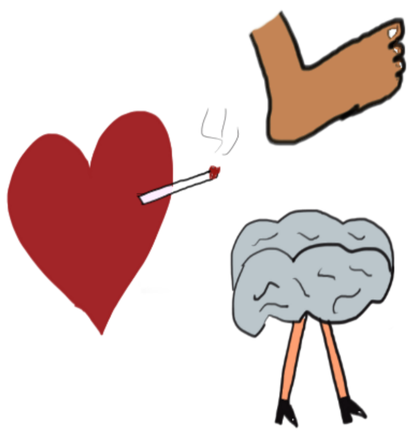




→ Sucesso > 30%

E aí?





→ Sucesso > 30%

Algumas referências

Prisoners and boxes
http://www.mast.queensu.ca/~peter/inprocess/prisoners.pdf

The traveling salesman problem: a computational study
Applegate, Bixby, Chvátal, Cook.

Wikipedia