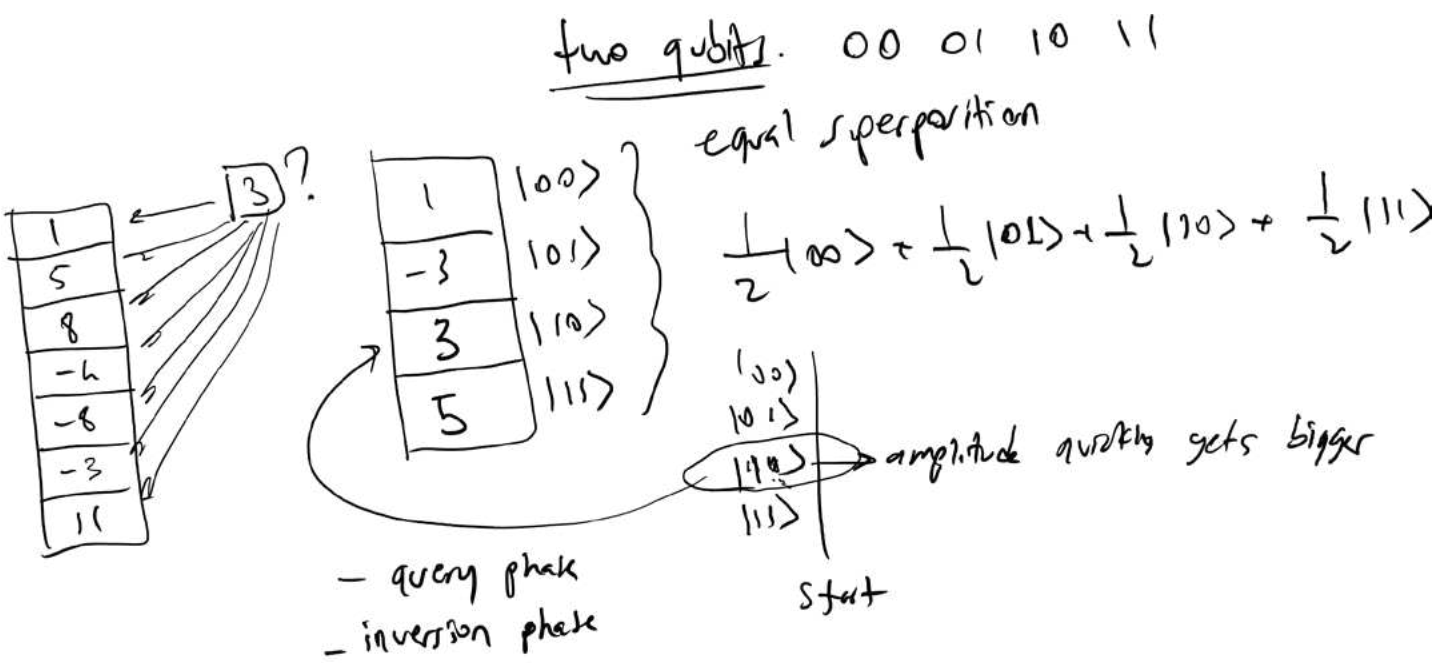
QWORLD

Saturday, October 29, 2021

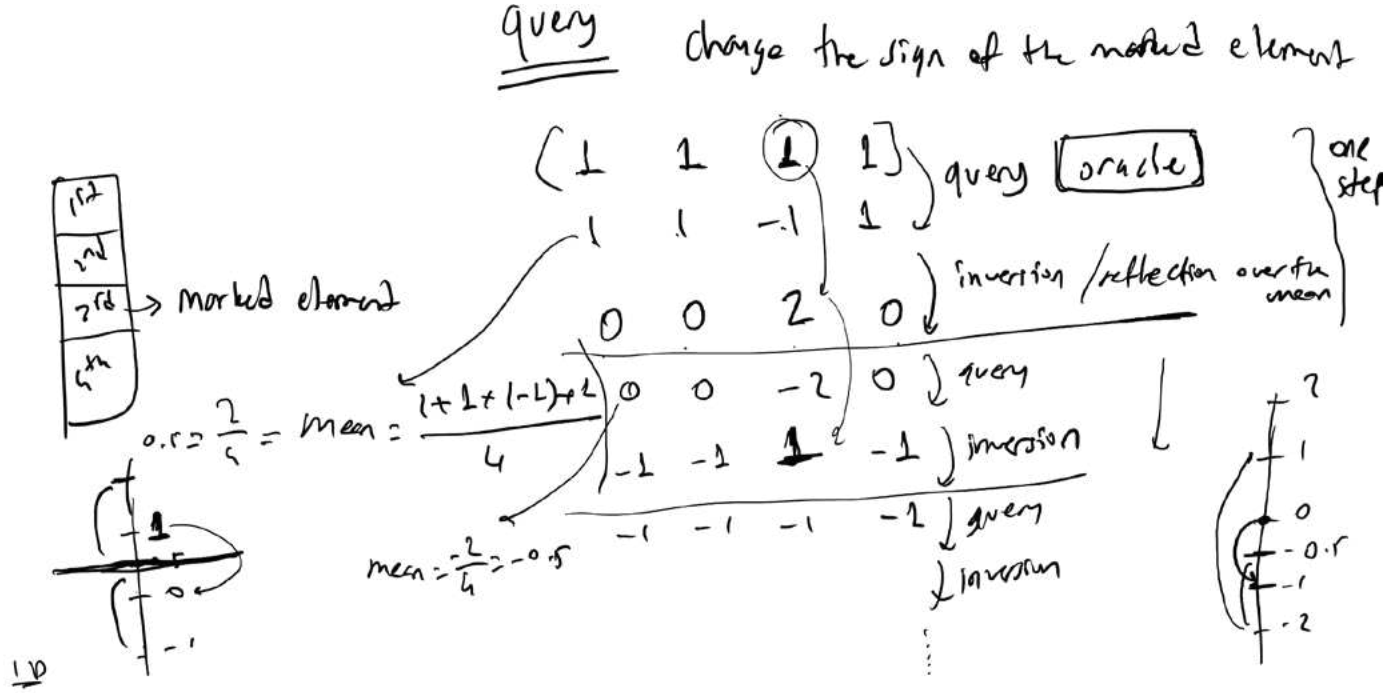
Grover's search algorithm

Quantum Computing & Programming Workshop | October 15-16 & 22-23 & 29-30, 2021

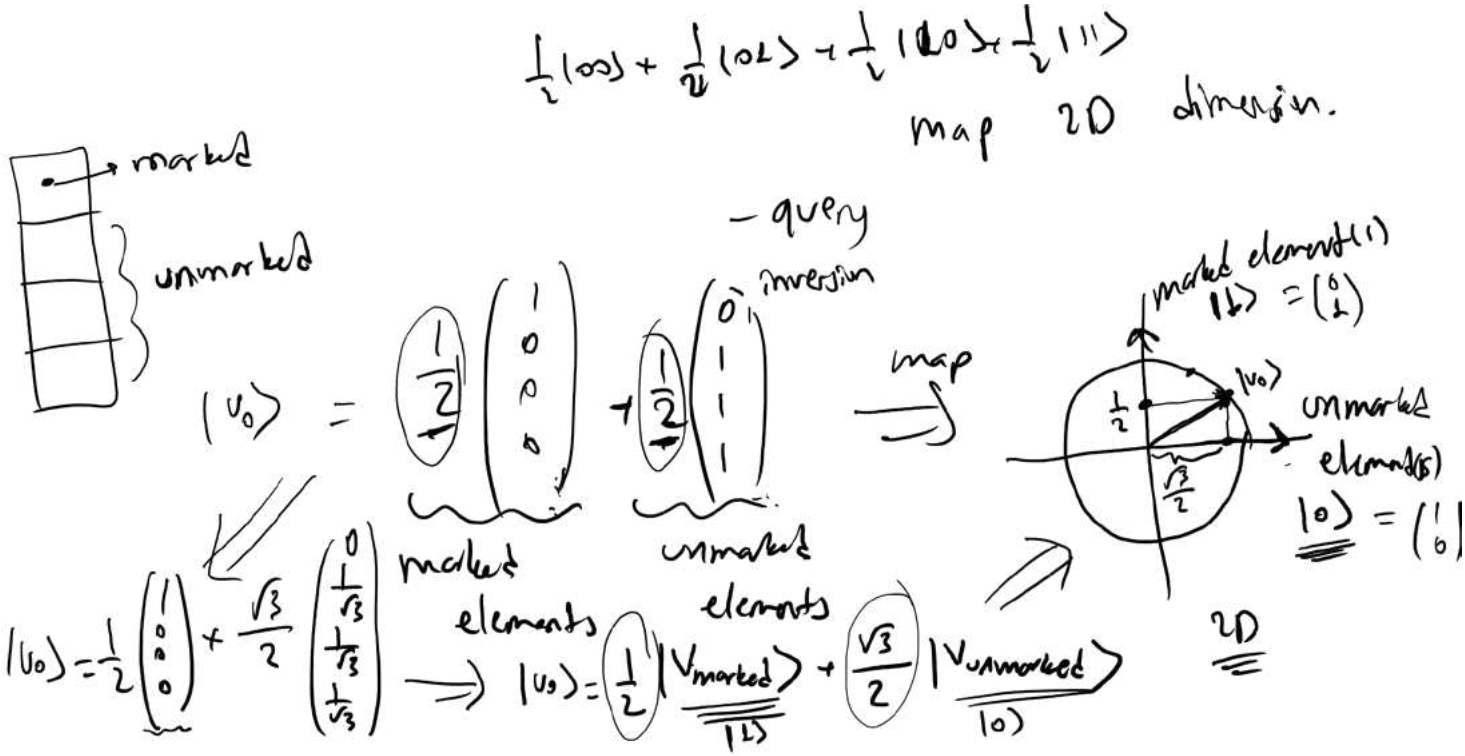
Searching on a list



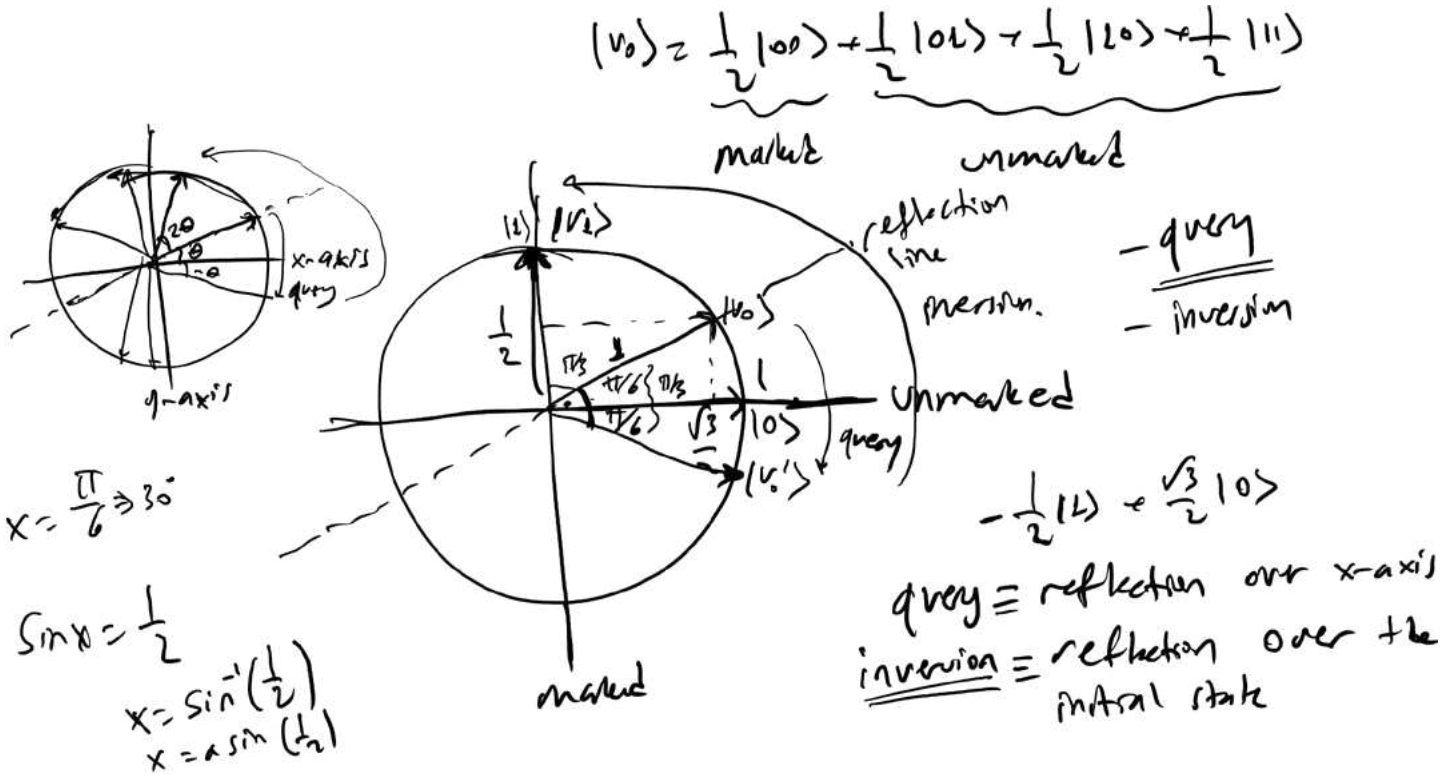
Query and inversion



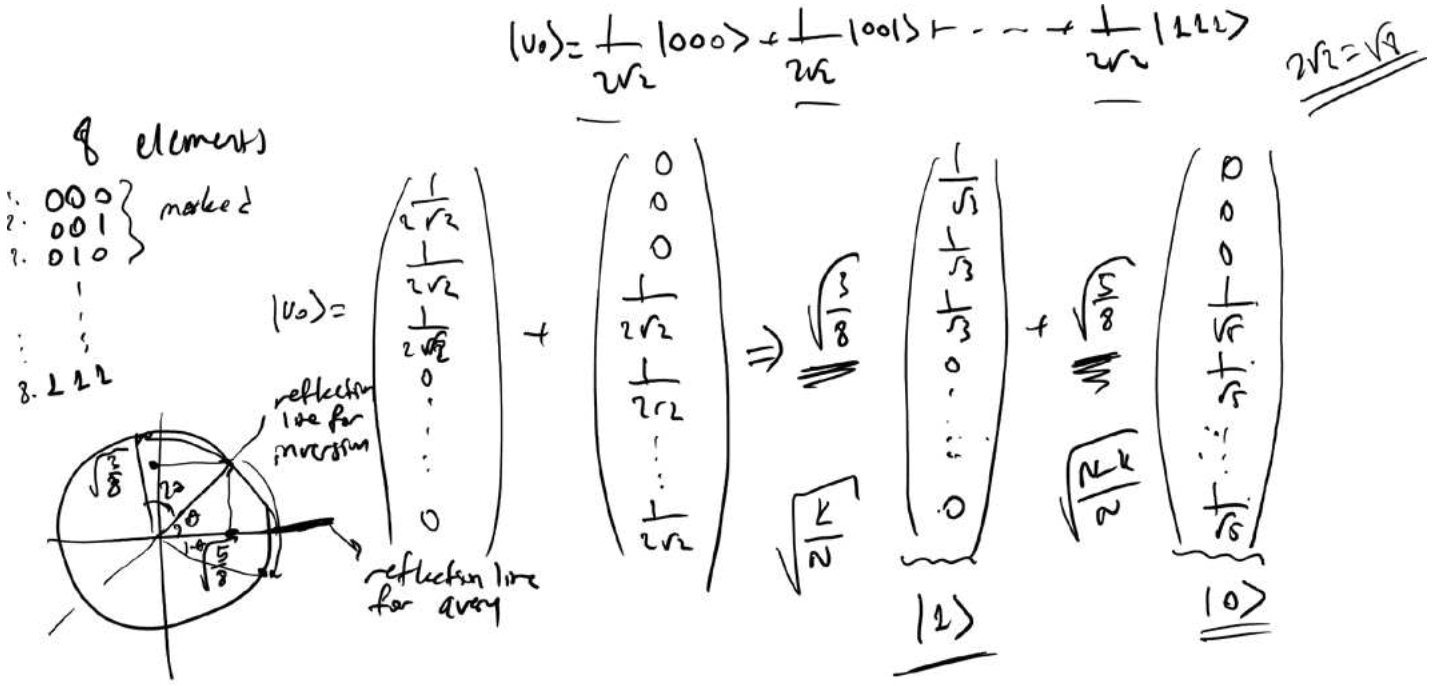
2D representation



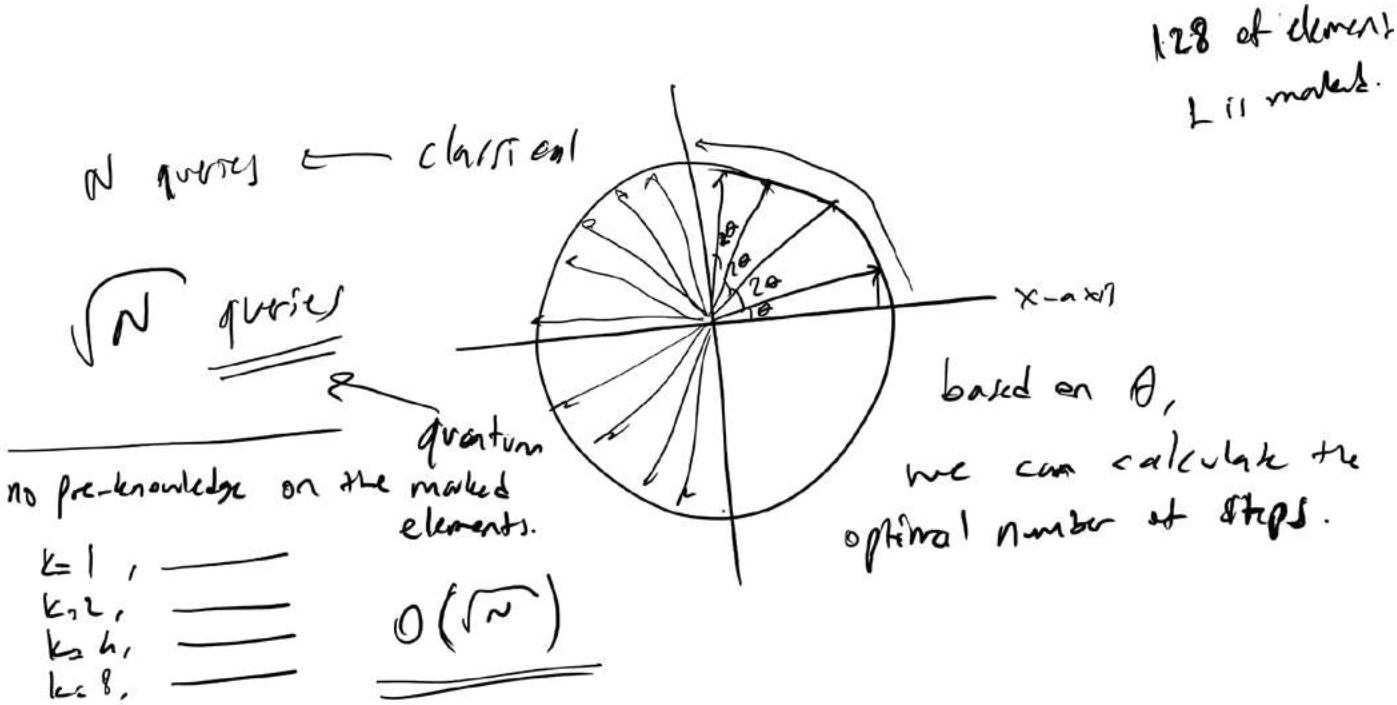
Reflection lines



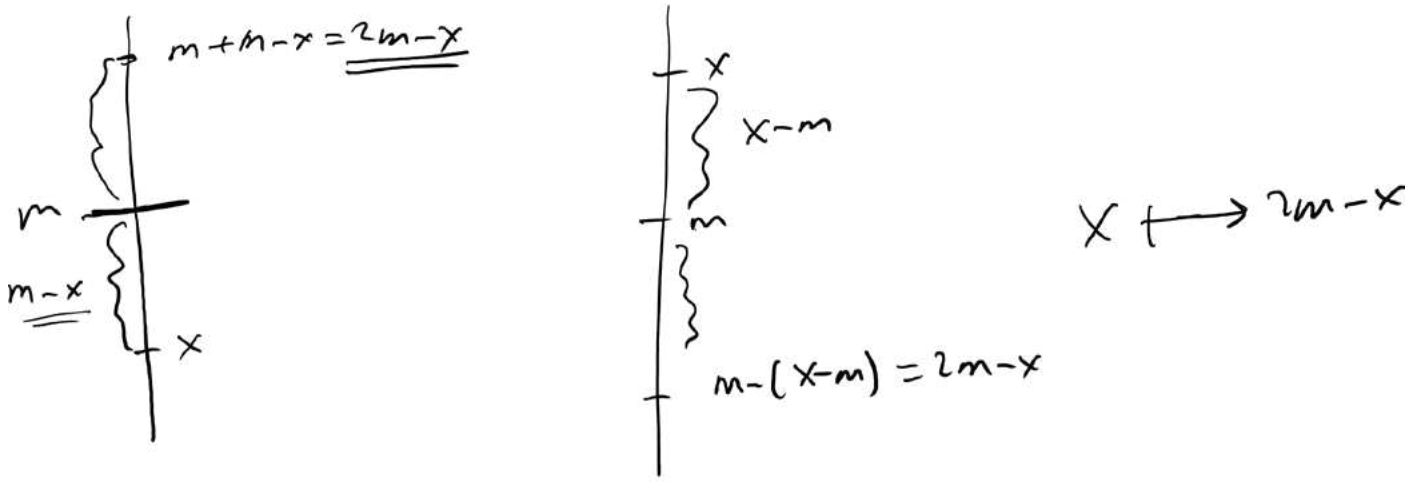
Another example



Rotations



Inversion about the mean



Inversion matrix

$$2\begin{pmatrix} \frac{1}{N} & \frac{1}{N} & \cdots & \frac{1}{N} \\ \frac{1}{N} & \frac{1}{N} & \cdots & \frac{1}{N} \\ \vdots & \vdots & & \vdots \\ \frac{1}{N} & \frac{1}{N} & \cdots & \frac{1}{N} \end{pmatrix} - \begin{pmatrix} 1 & & & 0 \\ & 1 & & \\ & & \ddots & \\ 0 & & & 1 \end{pmatrix}$$

$$2m = 2\begin{pmatrix} \frac{1}{N} & \frac{1}{N} & \cdots & \frac{1}{N} \end{pmatrix} \begin{pmatrix} a_1 \\ a_2 \\ \vdots \\ a_i \\ \vdots \\ a_N \end{pmatrix}$$

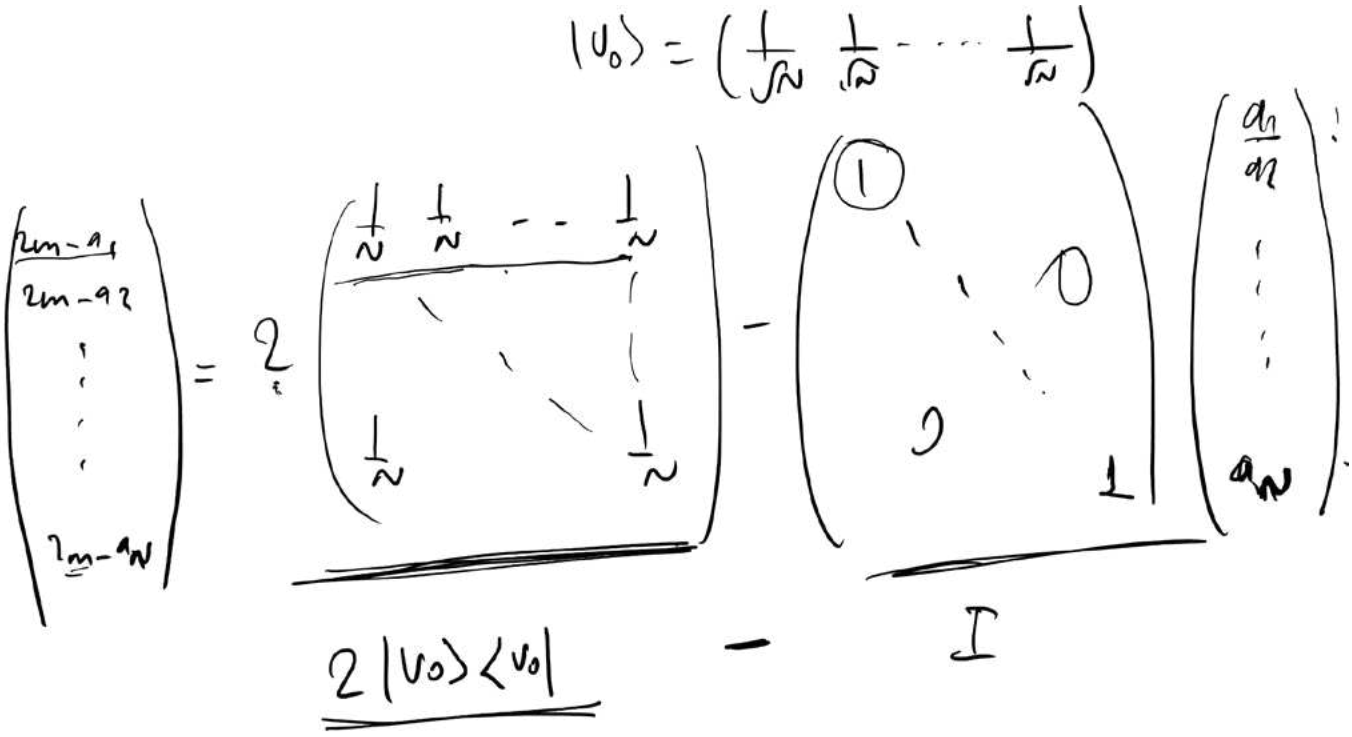
$$m = \frac{a_1 + a_2 + \cdots + a_N}{N}$$

$$2m - a_i$$

x_0?

$a_i \to 2m - a_i$

- Reflected state



- Reflection over the initial state