

## Unitary Error Base

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### Pauli Matrices

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} 0 & -i \\ i & 0 \end{bmatrix}$$

### Inner Product

$A, B$ :  $d \times d$  matrices.

$$\langle A, B \rangle = \text{tr}(A^* B) / d$$

$$\text{tr}(A) = \sum_i a_{ii}$$

### Conjugate Transpose

$$A^* = A^H = A^\dagger = \bar{A}^\top$$

$$\begin{bmatrix} i & 2+i \\ 1 & 3-2i \end{bmatrix}^* = \begin{bmatrix} -i & 1 \\ 2-i & 3+2i \end{bmatrix}$$

### Trace

$$\text{tr}(A) = \sum_i a_{ii}$$

$$\text{tr}(A \otimes B) = \text{tr}(A)\text{tr}(B)$$

$$\text{tr}(cA) = c\text{tr}(A)$$

$$\text{tr}(A) = \sum_i \lambda_i$$