Sample question from ACEPhysics activity:

**X gate (Also called “Not gate” or U_{Not gate})**

The X gate performs the function of a NOT gate, changing |0⟩ to |1⟩ and vice versa.

The mathematical expression that matches this sentence is $X |0⟩ = |1⟩$.

Mathematically, the X gate is written in matrix notation as

$$X = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$$

Take a moment to verify (using matrix multiplication) that

$$X |0⟩ = |1⟩ \text{ and } X |1⟩ = |0⟩.$$