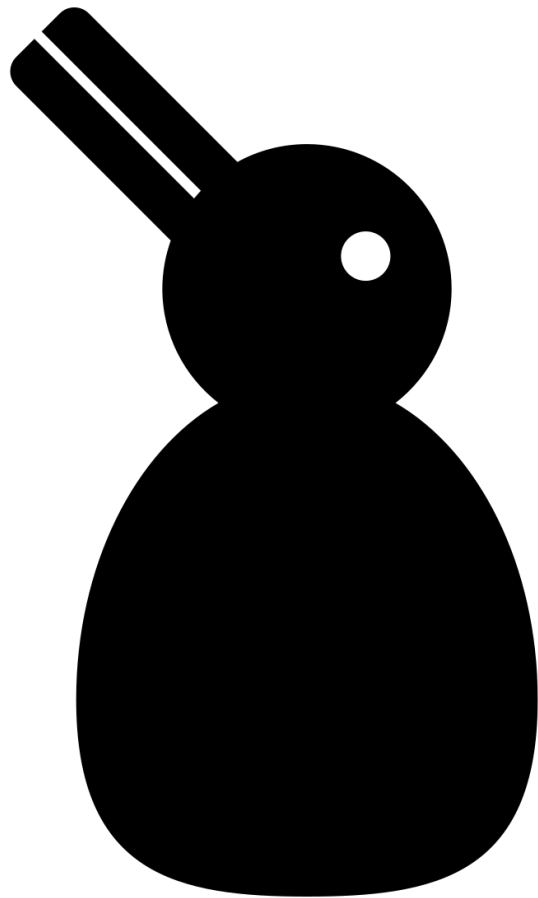




Spooky Superposition

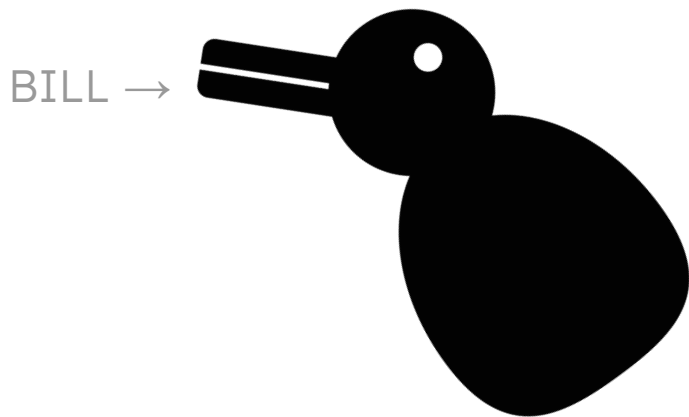


What do you see?



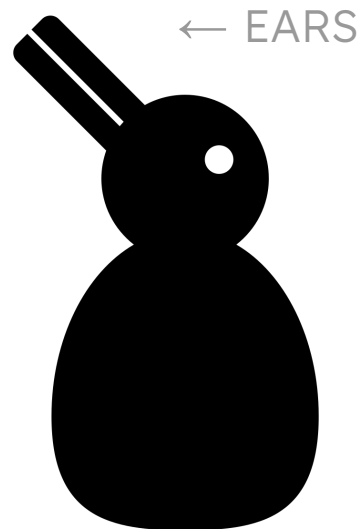
Superposition

When something is in **SUPERPOSITION**, it can be two things at once.



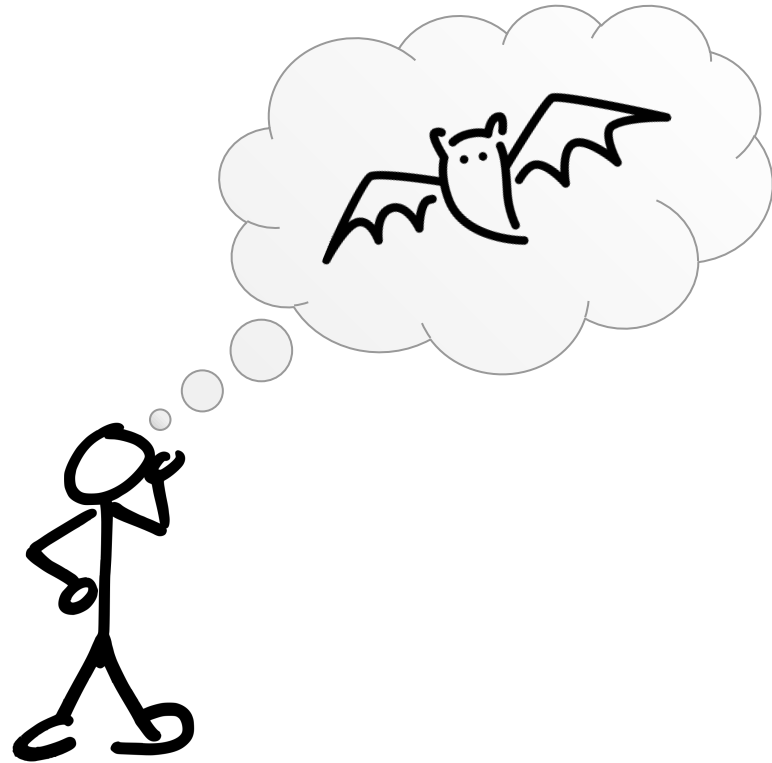
"It's a duck!"

AND

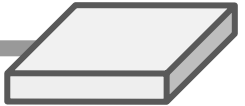
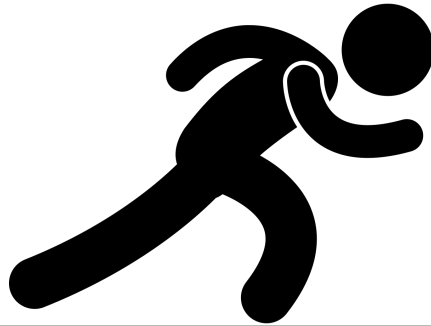


"It's a rabbit!"

“BAT”



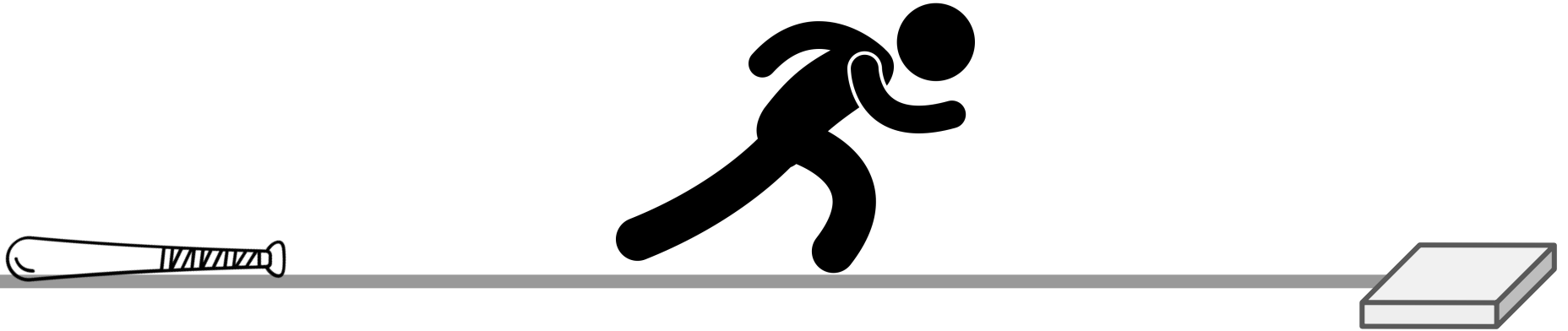
She dropped the **_BAT_** and ran to first base.



She dropped the **_BAT_** and ran to first base.

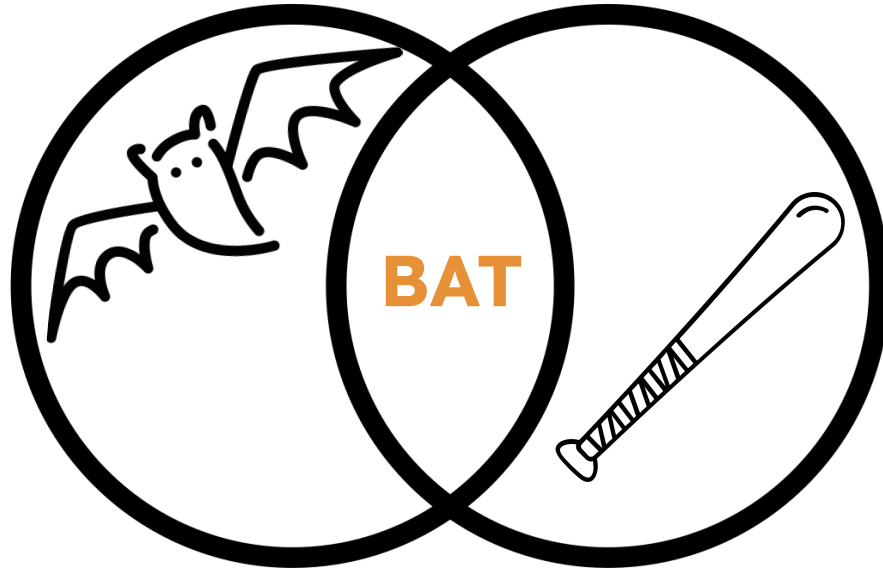


She dropped the **_BAT_** and ran to first base.



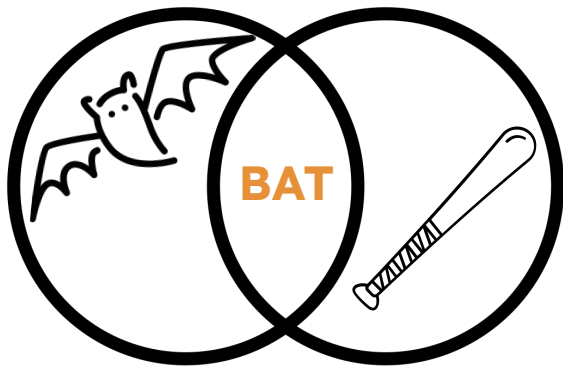
Superposition

The word “**BAT**” has more than one meaning.
It is an example of superposition.



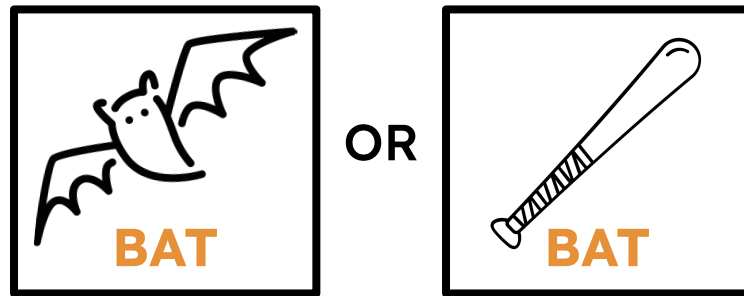
Superposition & Measurement

When something in superposition is **MEASURED**, it forces a decision to be made. After measurement, there is only ONE interpretation.



BEFORE MEASUREMENT

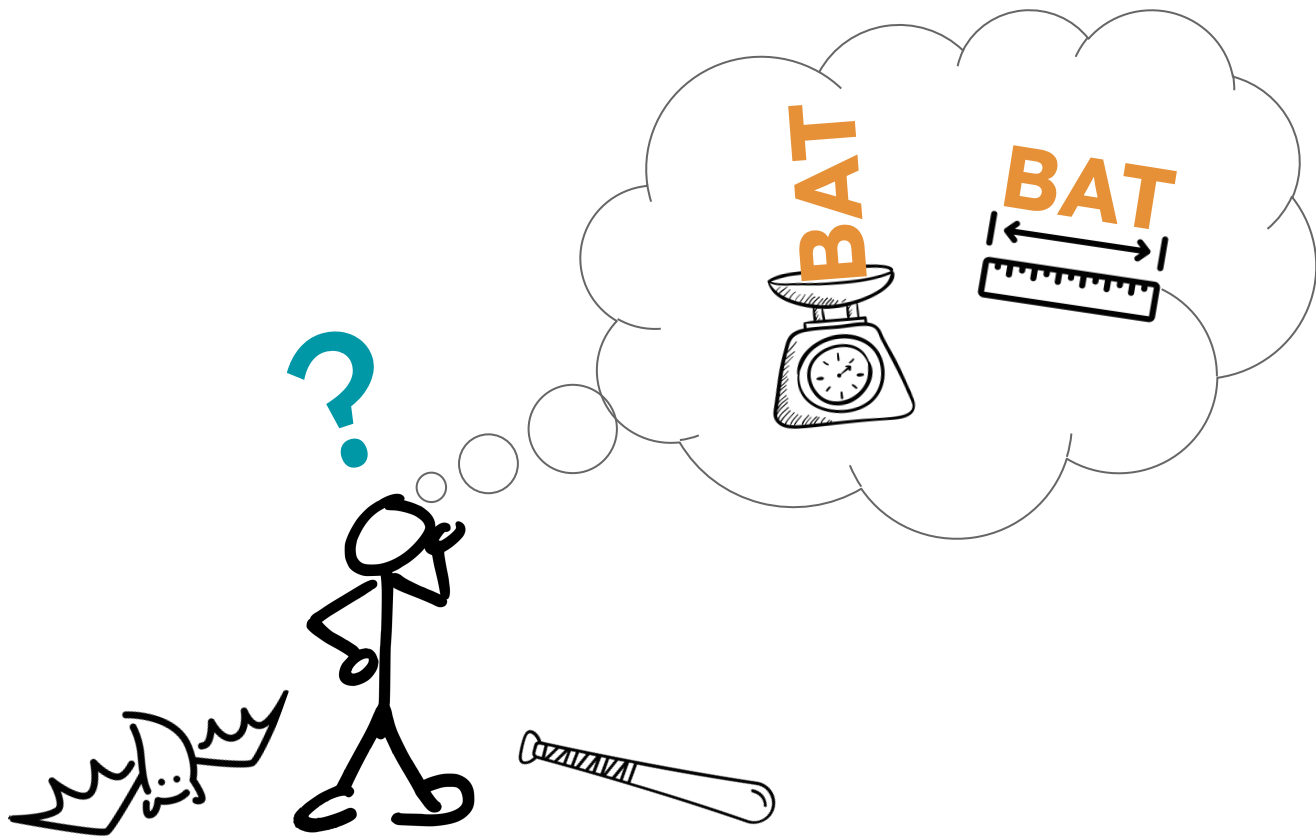
(superposition of two meanings)



AFTER MEASUREMENT

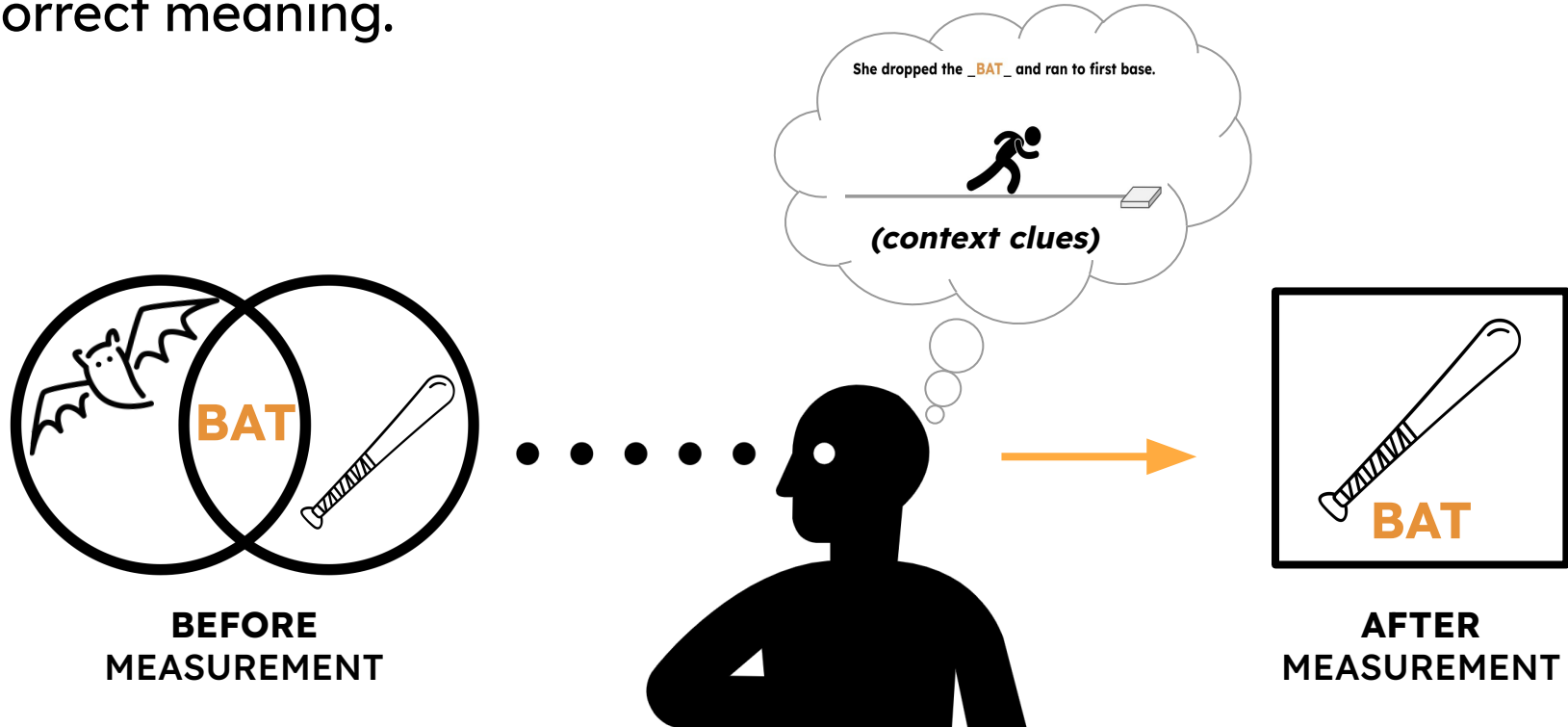
(one meaning)

Measurement?



How/When does measurement happen?

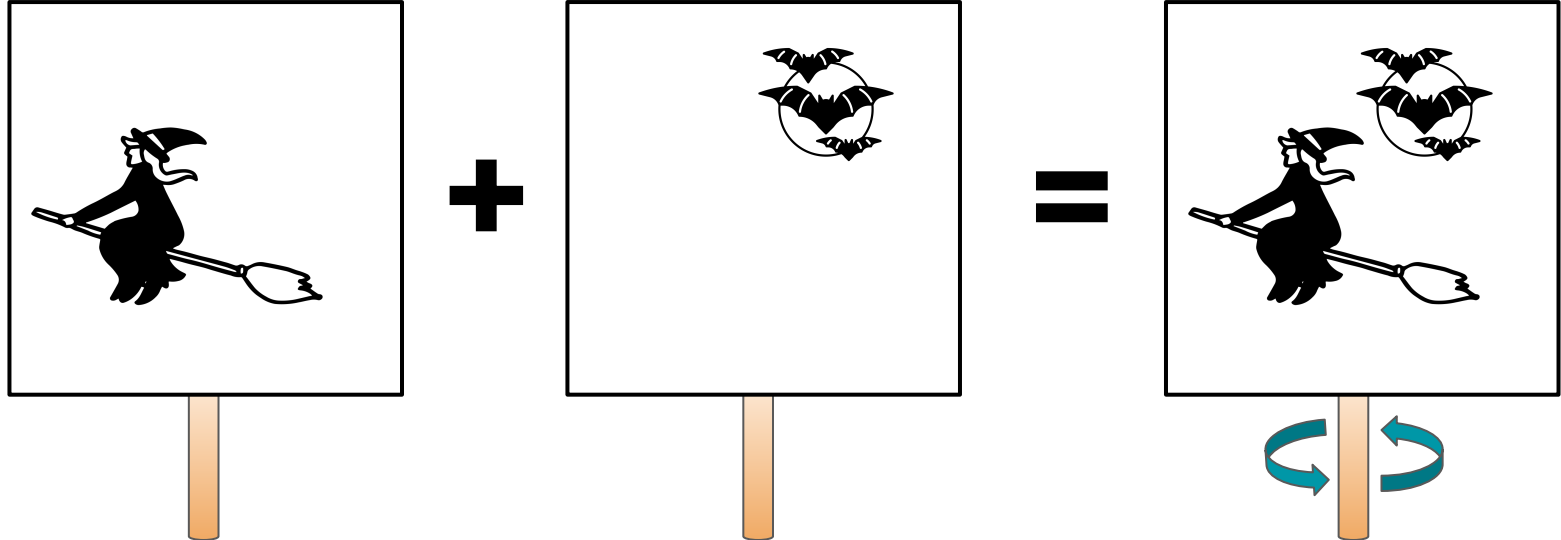
“**BAT**” is measured when readers use context clues to identify the correct meaning.



Superposition in Thaumatrope

Thaumatrope is an old-fashioned toy that creates an illusion of two images being combined into one.

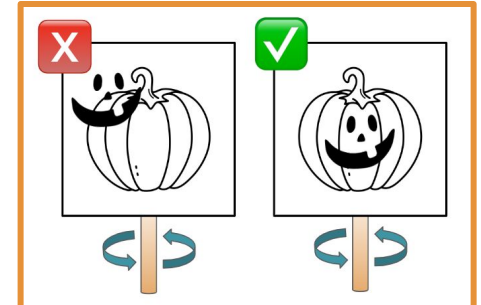
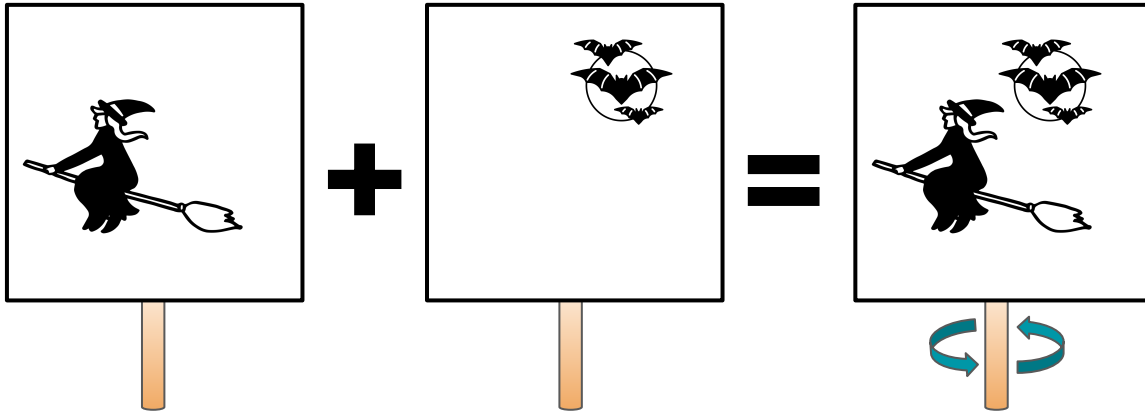
They are a physical example of superposition.



Design a Spooky Thaumatrope!

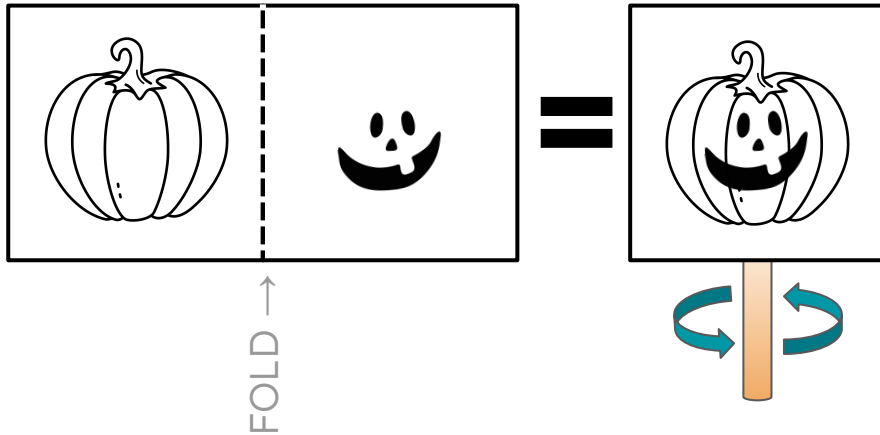
Use superposition to create your own Spooky Thaumatrope!

As you work, think about ways to “measure” a thaumatrope.



NOTE: Be sure to think about how the two parts of your design will line up!

Design a Spooky Thaumatrope



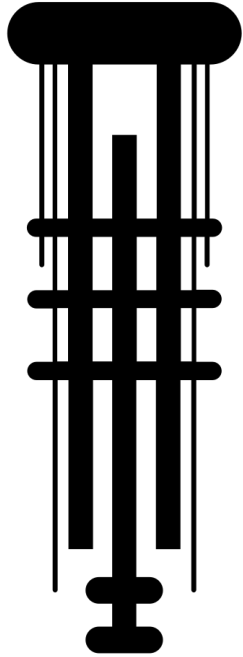
1. Choose a design that you can separate into TWO parts.
 - Pumpkin & Jack-o-lantern Face
 - Witch & Bats
 - Haunted House & Spooky Tree
 - Ghost & Mummy
2. Fold a piece of cardstock in half and draw one part of your design on each half.
3. Use tape to attach cardstock to a pencil (or other stick).
4. Roll the pencil between your hands to see your design!



Share your Spooky Thaumatrope!



Quantum Computers use Superposition!



Quantum Computers are a new kind of computer currently being developed by researchers.

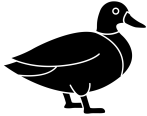
They use superposition (and related ideas) to store information and solve problems in ways that classical computers cannot.

Classical Computers

- Use “***bits***” to store information

Bits can only store a value of 0 or 1

- Designed to quickly calculate *THE* answer to a problem



0



1

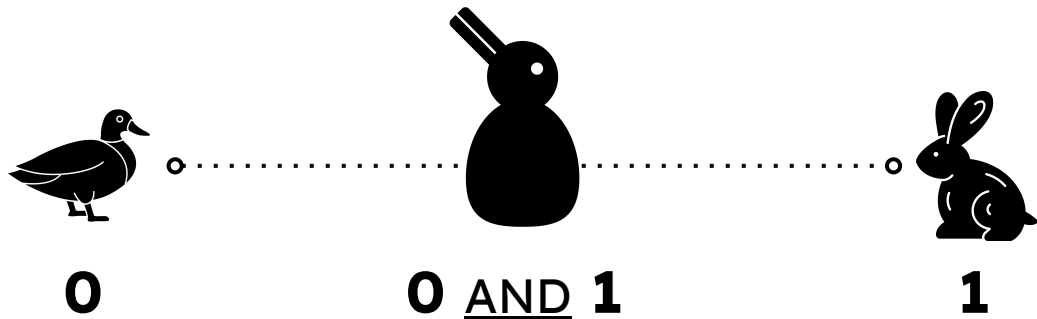
Quantum Computers

- Use **quantum bits** (**qubits**) to store information

Like bits, qubits can store a value of 0 or 1.

Qubits can hold a **superposition** of 0 and 1 at the same time!

- Use superposition & related concepts to keep track of many possible solutions - AT THE SAME TIME!





Spooky Promising!

Researchers think quantum computers will help solve many important and previously unsolvable problems.



<https://www.epiqc.cs.uchicago.edu/resources>



This material is based upon work supported by the National Science Foundation under Grants No. 1730088 and No. 1730449. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.



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