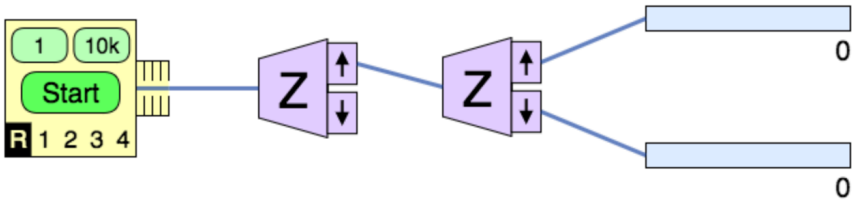
1. Set-Up a Sequential Measurement

   a) Add an analyzer to the experiment by:

      i. Break the links between the analyzer and the counters by clicking on the boxes with up and down arrow labels on the analyzer.

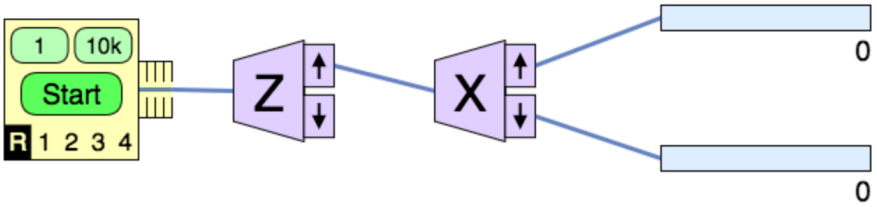
      ii. Click and drag a new connection from the analyzer to empty space to create a new element. A new analyzer is one of the options.

   b) Measure S_z twice in succession.



What is the probability that a particle leaving the first analyzer with $S_z = \frac{+\hbar}{2}$ will be measured by the second analyzer to have $S_z = \frac{-\hbar}{2}$?

   c) Set the first analyzer to measure S_z and the second analyzer to measure S_x.



What have you learned from these experiments?

> **Solution** The distribution between the two counters for unlike analyzers is half and half (though not exactly half and half for a finite number of particles). Which port the particle goes in seems to be random.

2. Try All Combinations of Sequential Measurements

   In the table, enter the probability of a particle exiting the 2nd analyzer with the spin indicated in row if the particle enters the 2nd analyzer with the spin indicated in each column.

			Spin of particles going INTO 2nd Analyzer					
			S_z		S_x		S_y	
			$+\hbar/2$	$-\hbar/2$	$+\hbar/2$	$-\hbar/2$	$+\hbar/2$	$-\hbar/2$
Spin of Particles coming OUT of 2nd Analyzer	S_z	$+\hbar/2$						
		$-\hbar/2$						
	S_x	$+\hbar/2$						
		$-\hbar/2$						
	S_y	$+\hbar/2$						
		$-\hbar/2$						

3. You can rotate the Stern-Gerlach analyzers to any direction you want (using spherical coordinates). Choose an arbitrary direction (not along one of the coordinate axes) for the 1st analyzer and measure the spin along the coordinate directions for the 2nd analyzer.

$\theta =$ $\phi =$		Spin of particles going INTO 2nd Analyzer					
		S_z		S_x		S_y	
		$+\hbar/2$	$-\hbar/2$	$+\hbar/2$	$-\hbar/2$	$+\hbar/2$	$-\hbar/2$
Spin of Particles coming OUT of 2nd Analyzer	$S_n = +\hbar/2$						
	$S_n = -\hbar/2$						