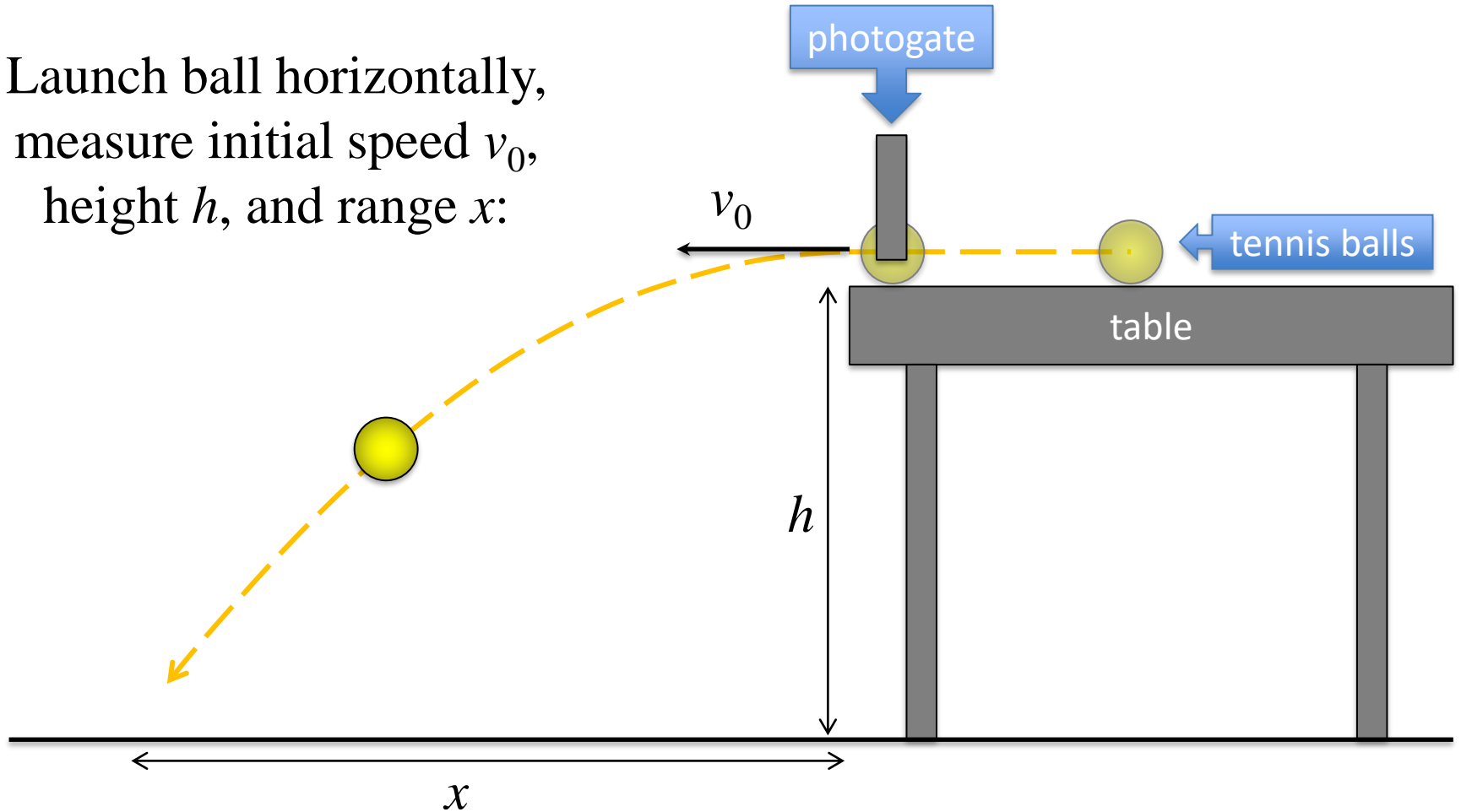


Mini-Lab: Projectile Motion – Verify Expected Behavior

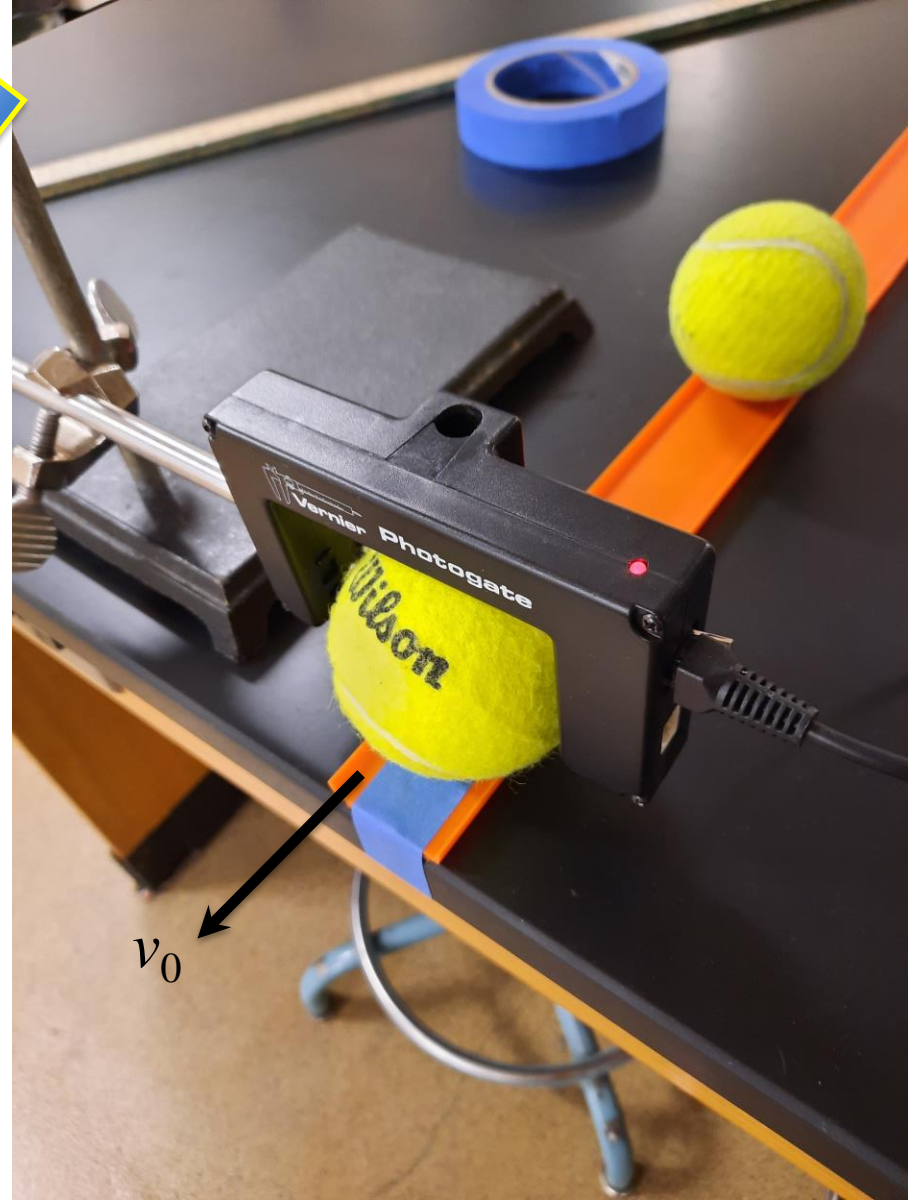
1. Use masking tape to attach a short length of track right at the edge of a table to create a “launching ramp”.
2. Attach a photogate to a ring stand and arrange to measure the tennis ball as it leaves the ramp and flies off the table.
3. Connect the photogate to LabQuest Mini DIG1. **Change** photogate timing mode to Speed through Gate – enter the diameter of the tennis ball (which is very close to 6.5 cm).
4. Place meter sticks on the floor to measure range.
5. Hold a second ball and use it to hit the first ball and launch it horizontally through the gate. Record speed and range.
6. Repeat at least 5 trials with various values that show a relationship when graphed. Record height of table.

Launch ball horizontally,
measure initial speed v_0 ,
height h , and range x :



Note to self: demonstrate how to launch one ball while holding the other!







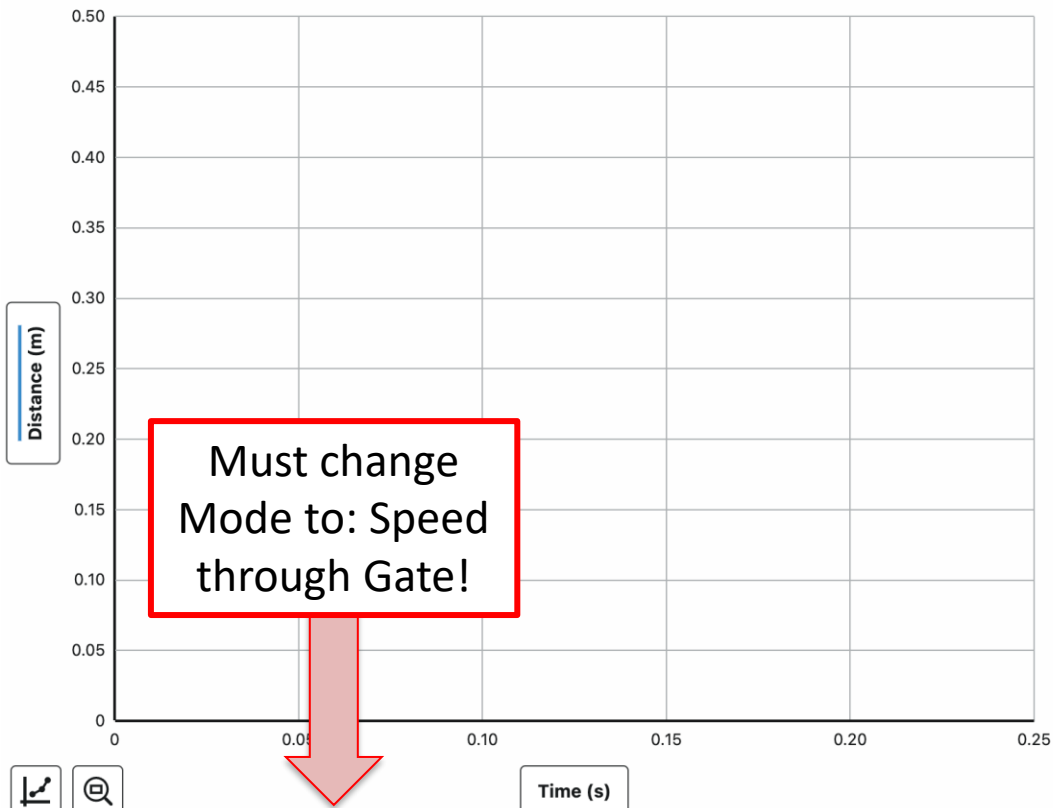
Photogate

Make sure the shutter is open (slide up).

Adjust so that infrared beam is centered on ball. (Beam appears to be a tad too high here!)

Untitled

COLLECT



Must change
Mode to: Speed
through Gate!

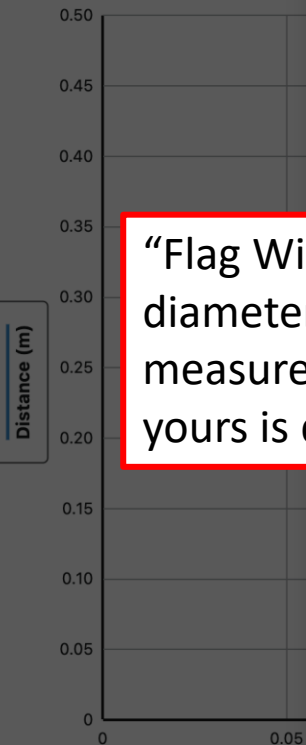
Data Set 1

State	Distance (m)	Velocity (m/s)
1		
2		
3		
4		
5		

Gate States:
0 = not blocked
1 = blocked
(useful to check for
proper operation)

Gate State: 1

Untitled




“Flag Width” is diameter of ball – measure it in case yours is different!

Data Collection Settings



Mode Photogate Timing

 Speed through Gate Use object / flag width (Gate timing) 

Flag Width

 m Use gate separation (Pulse timing)

Distance between gates

 m

- Linear Motion (distance, velocity, acceleration)
- Angular Motion (distance, velocity, acceleration)
- Timer or Period
- Projectile Launcher

CANCEL

DONE



Data Set 1

Distance (m) ...

Velocity
(m/s)

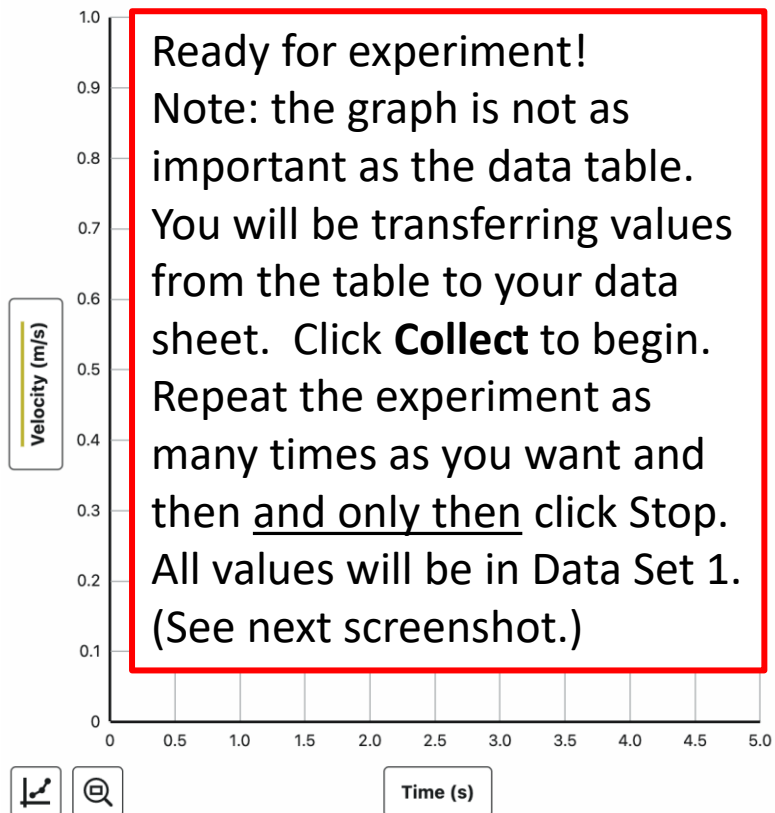
Gate State: 1



Untitled

COLLECT

((o)) ↺ 🗪 ...



Data Set 1				
	Time (s)	Gate State	Gate Time (s)	Velocity (m/s)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

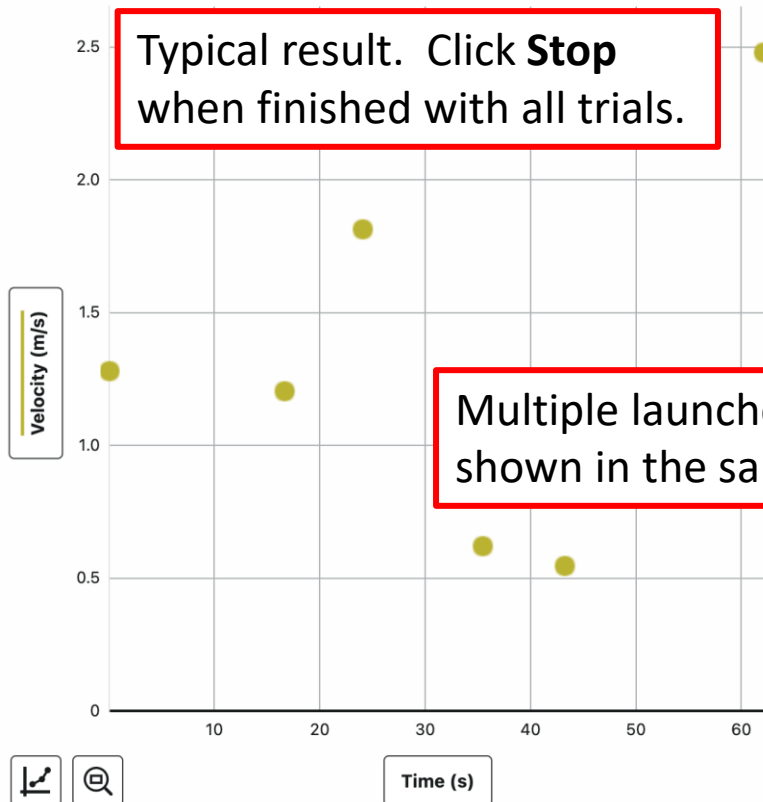
Mode: Photogate Timing Speed through Gate

Gate State: 0



Untitled

STOP



Multiple launches of the ball shown in the same data set.

Data Set 1

	Time (s)	Gate State	Gate Time (s)	Velocity (m/s)
2	0.05080	0	0.050799	1.280
3	16.61855	0		
4	16.67254	0	0.053995	1.204
5	24.05246	0		
6	24.08830	0	0.035845	1.813
7				
8				
9				
10	43.25967	0	0.119025	0.546
11	48.32124	0		
12	48.35038	0	0.029143	2.230
13	62.12428	0		
14	62.15050	0	0.026218	2.479

Mode: Photogate Timing Speed through Gate

Gate State: 0



