

Marble Launcher

Assembly Instructions

This spring loaded Marble Launcher provides a fun, yet quantitative introduction to two-dimensional motion. With a maximum range of 8 meters, the launcher features five different launch speeds, repeatability to within a few percent, and a built-in protractor for setting the launch angle. The photogate easily attaches to the launcher so students can make precise measurements of the initial velocity of the marble.

To make the Marble Launcher a more effective learning tool a detailed Curriculum Resource Guide (CRG) is available. The CRG includes a set of multi-level, classroom-ready activity guides which provide structured student explorations.

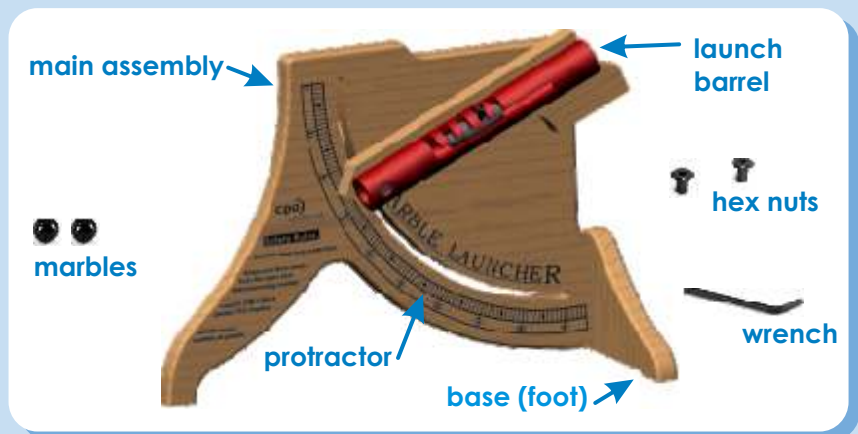
Parts Checklist

The following items are provided with the Marble Launcher:

- main assembly with launch barrel
- base (foot)
- black plastic marbles (2)
- hex nuts, t-style (2)
- hex wrench

In addition, you will need these items:

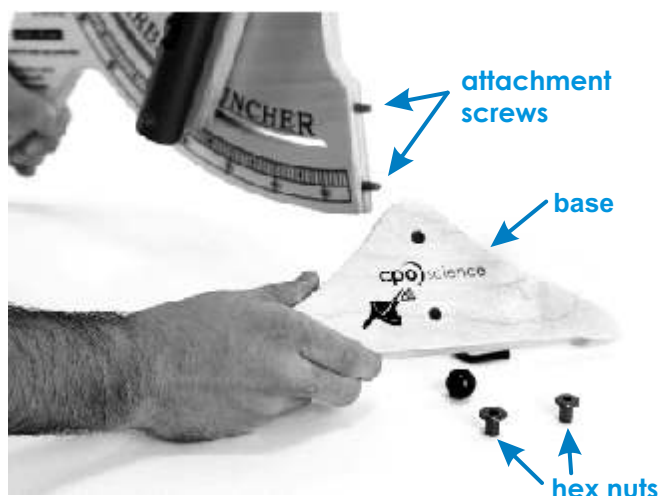
- timer console with power transformer
- photogate with red or blue cord



1. Setting Up the Marble Launcher

The marble launcher itself has two parts: the base and the main assembly. These two parts attach together with hex nuts. The hex nuts fit onto attachment screws that are embedded into the bottom of the main assembly.

Line up the two holes in the base with the attachment screws on the main assembly.



2. Attaching the Base

The hex nuts fit onto the attachment screws through the holes in the base. Use the small hex wrench to tighten both until snug.



Assembly instructions continue on page 2.

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3. Loading the Marble

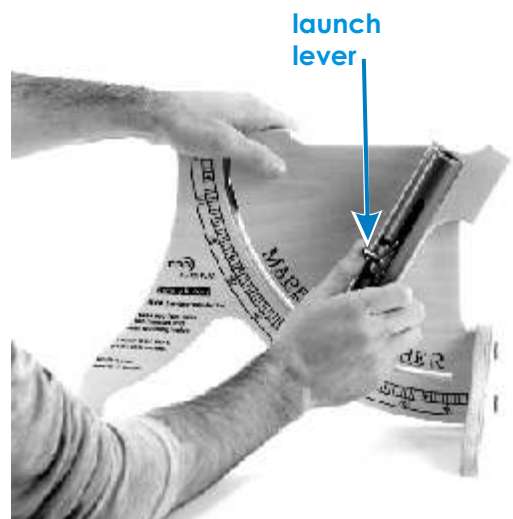
Set launcher to desired angle before loading the marble. To load, put the marble right into the hole at the top of the barrel. **Be sure to load the marble into the barrel before pulling the launch lever back into the locked and ready to fire position.**



4. Launching the Marble

After loading the marble into the barrel, pull the launch lever back to one of the five possible notches and set into place. The marble launcher will be ready to launch.

Push down on the launch lever gently with your thumb to slowly slide the lever off the notch to send the marble flying.

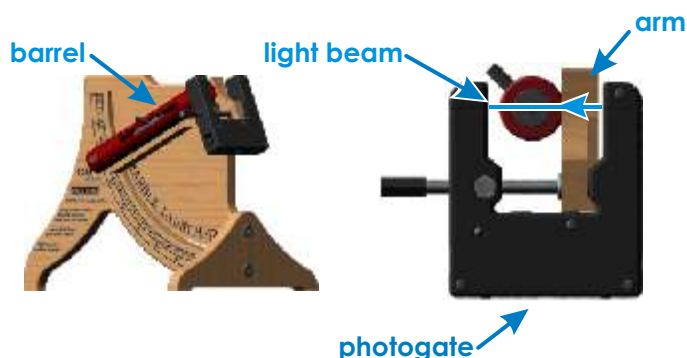


5. Attaching a Photogate & Timer

The photogate attaches to the tab on the end of the wood "arm" that supports the barrel. Be sure that the light beam crosses the center of the barrel so you get an accurate speed measurement.

Next, connect one end of the phone cord to the photogate. Connect the other end of the phone cord to the timer into the slot marked "A".

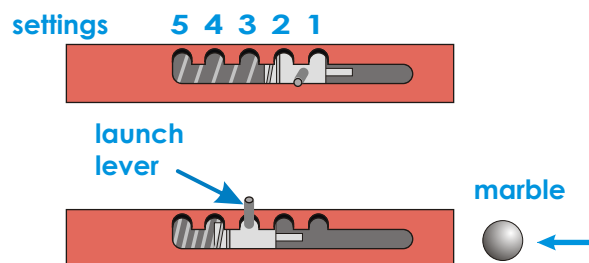
If d is the diameter of the marble (0.019 m) and t_A is the time interval during which the light beam was broken (in seconds), then the initial velocity of the marble is d/t_A in m/s.



6. Using Launch Settings

Pull the lever into one of the five settings (notches). Launch the marble by slowly moving the lever of the notch toward the long slot. Setting 1 is the slowest setting and 5 is the fastest.

PLEASE FOLLOW SAFETY GUIDELINES PRINTED ON LAUNCHER.



For activities, refer to the *Marble Launcher Curriculum Resource Guide, Physics, A First Course Investigations manual or Teacher's Guide.*