Ropes & Pulleys

The Ropes & Pulleys

The Ropes & Pulleys set is an ideal tool for teaching students the concepts of simple machines, force, work, and energy. The unique construction of this apparatus helps prevent hopelessly tangled strings and features low-friction ball bearing pulleys for accurate force measurements. Simple block and tackle machines with mechanical advantage from 1 to 6 are easy to construct.

Materials Checklist

- 1 Physics Stand assembly
- 1 Pulley block assembly
- 1 Black plastic knob
- 1 Threaded knob with attached black plastic knob
- 1 Set of Weights
- 1 Set of Spring Scales
- 1 Yellow string with cord stops
- 1 Tape measure

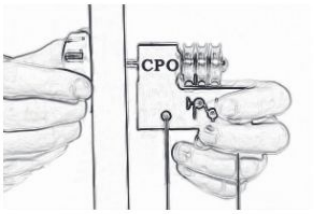
Assembly

Step One: Assemble the Physics Stands

Assemble the appropriate number of Physics Stands (based on how many lab stations are to be set up) by following the instructions on the Physic Stand Setup.

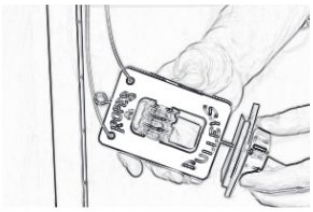
Step two: Attach the pulley block assembly to the Physics Stand

Slide the threaded rod that is attached to the upper pulley block through the selected hole in the Physics Stand (preferably one near the top). Secure the pulley block with the black plastic knob. You should now have the upper pulley block secured, while the lower pulley block hangs below on the two red safety strings.



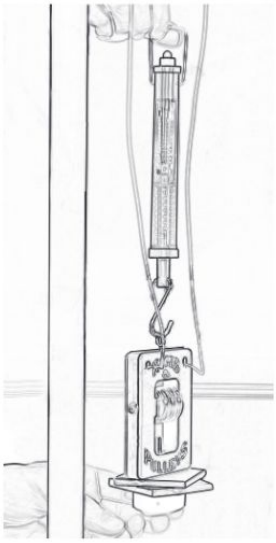
Step three: Attaching weight to the lower pulley block

Add weight to the lower pulley block by sliding the threaded rod with attached black knob through the center hole of the weights and screwing it into the bottom of the lower pulley block.



Step four: Weighing the lower pulley block

After the weight has been secured, weigh the lower pulley block assembly by hanging it on a spring scale using the eyelet that is screwed into the top of it. Record the weight.



Step five: Stringing the pulley blocks for a specific mechanical advantage

The yellow string is the one you will use to move the lower pulley block up and down. The yellow string may have several strands that support the lower pulley block. These are called the supporting strands. The red strings are the safety strings and these hold the bottom block while you arrange the yellow strings on the pulleys. The cord stops are used as reference markers for measuring the length of string needed to raise the lower block a given distance.

The first step of stringing the Ropes & Pulleys is to choose where to connect the brass clip on the end of the yellow string. The clip can either be attached to the upper pulley block or the lower pulley block using the eyelet on either block.

If the string is connected to the lower pulley block a mechanical advantage of 1, 3 or 5 can be obtained (1, 3, or 5 supporting strings). The diagram below shows a mechanical advantage of one.

If the string is connected to the upper pulley block a mechanical advantage of 2, 4, or 6 can be obtained (2, 4, or 6 supporting strings). The diagram shows a mechanical advantage of 2.

Step six: Taking measurements

In addition to weighing the bottom block, there are three other measurements to take.

To measure effort force, slip the spring scale hook over a cord stop. Now pull the spring scale to raise the lower pulley block. Record the force measurement from the spring scale.

To measure effort length, place a cord stop on the yellow string up against the pulley on the upper block. When positioning the cord stop, make sure the string is held taut but not yet lifting the lower pulley block. Pull string and hold. Using the cord stop as a reference, have another student measure the distance back to the pulley. Record the length.

To measure the distance traveled by the lower pulley block, use the holes in the Physics Stand as references. They are exactly 5 cm apart.