

Pulleys in equilibrium

Background

A sash window offers a practical use of pulleys. The window to be raised is attached to a pair of counter-weights, whose sum equals the weight of the window. The ropes connecting the window to the two counter-weights, pass over smooth pulleys. Because the system is in equilibrium, very little effort is needed to open the window. Also, the window will stay at rest at any position that is required.

You will need...

- ✓ Two identical picture frames (remove the backing to expose the glass) two pulleys and two suitable weights and some string. A timber frame needs to be constructed to mount the pulleys and support the windows in a manner that they can move.

Follow these steps

1. Obtain two identical picture frames of a suitable size.
2. Cut suitable lengths of timber to make the window frame and glue together using wood adhesive.



3. Fix the pulleys to the top of the frame.
4. Attach the two weights to the top of the lower picture frame using string (that passes over the pulleys)
5. Adjust the amount of weight so that the system can move freely and so that it rests in equilibrium when no force is applied.

So what happened?

The window was raised and lowered with minimal effort due to the state of balance between the forces. It also stayed at rest at any desired height.

What next?

Put your head out the open window and see that it doesn't fall on your head.