

Tension and Pulleys



Purpose: Demonstrates pulleys and (indirectly) the idea of tension.

This demo consists of a single-block, twin single-blocks, and a twin double-block pulley setup, together with a weight and a spring scale. Hooks allow the pulleys to be rigged to advantage or disadvantage, so that the students can see fairly clearly that the number of lines 'attached' to the moving block determines the tension.

Note: Using a big weight makes the spring scale reading accurate (and hides the friction issue).

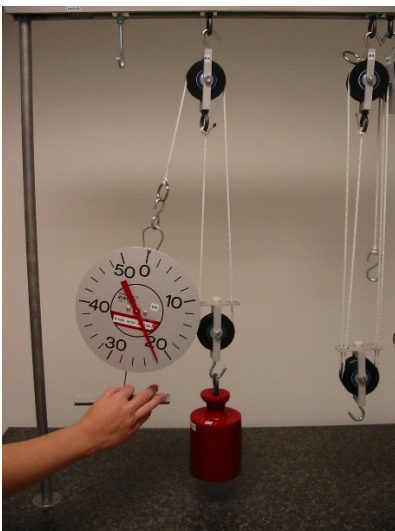
To set up, use the new cart with the double ring stands. The cross bar fits onto the top of these in an obvious way. The eyebolts that

support the pulleys are mounted on T-nuts. These can be inserted into the cross bar at the notch and then slid to the desired location.

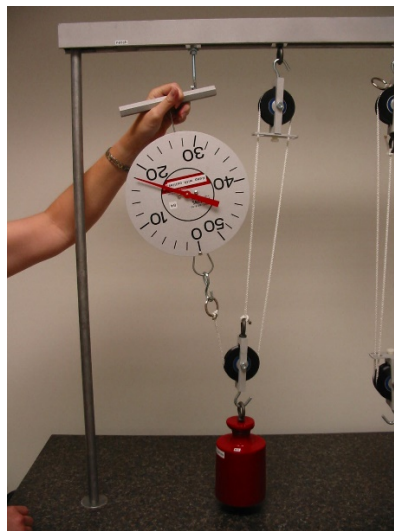
The pulleys can be used individually or combined. (They are quick to rearrange.)

The photos below show an example:

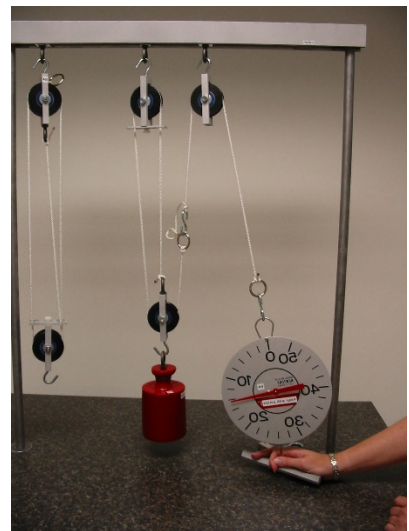
- A) The twin-blocks rigged to disadvantage (2:1). Tension is ≈ 22 N.
- B) Now, rigged to advantage (3:1). The scale reads a smaller tension, but the reading includes the weight of the scale.
- C) Again rigged to advantage, but now the single block is included so we can pull down with the scale. This eliminates the scale's weight from the reading. The tension now reads between 14 and 15 N, which is in agreement with what we expect, *i.e.* $(2/3) \times 22 \text{ N} = 14.7 \text{ N}$.



A



B



C

Extra Equipment: The double ring-stand cart.

Location: Shelf B4