WHEEL & AXLE

MODEL GS-301

The Wheel and Axle is used to show the relationship and significance of various pulley diameters when used in a mechanical system. The GS-301 consists of a molded wheel with four individual pulleys of different diameters. The ratios of these diameters is a sequence of approximately 3, 2, 1.5, and 1. The ratios are not exact because of mold wear through the years and the shrinkage of the plastic as it cools after the molding process. They are, however, within five percent.

To begin, mount the wheel to the axle in a horizontal position using any standard laboratory post and clamp system.

Note that there is a small hole drilled in each pulley level. This is to allow a piece of string to be inserted and secured on the back side with a knot or by tying it around a short piece of match stick or other suitable material. Now take several turns around the pulley and hang a weight on the end of the string. Repeat this at another pulley level, winding the string in the opposite direction. Now determine how much weight must be added to balance the wheel and keep it from turning.

One simple way to do this is to attach a large paper clip to the end of each string and to then hang small washers on this "hook" until you have achieved balance. Now simply count the number of washers and it will be found that their ratio is the same as the ratio of the pulley diameters.

If you want to work with actual pulley diameters, wrap a piece of string around the pulley and put a pencil mark across any two adjacent turns. Measure the length between marks and divide by pi.

There are other ways of using the wheel and axle to show the mechanical advantage of various pulley diameters. For instance, it can be used on a level surface to pull a block against friction. It can also be used to slide a block or roll a cart up an inclined plane.

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