Pulleys are simple machines made of rope wrapped around a wheel.

Types of pulleys:

1. Fixed pulley
   - Object moves
   - Pulley stays in the same spot
   - Force applied only on one end of the rope

   \[ \text{MA} = \frac{\text{Direct force}}{\text{Applied force}} \]

Try it:

1) Describe the weight you’ve selected:
   a. Color - ______________
   b. Mass - ______________
2) Find the weight of the load (direct force) using the spring scale. ______________ N
3) Hook a single wheel pulley to the ring stand. Put the small string through the pulley and hook one end up to the load and the other end to the scale. Pull the load up. How much force was needed to do this? ___________ N
4) Calculate the M.A. of the fixed pulley. Show the formula and work. (see notes 32 for the formula)
   M.A. =

5) How far did you pull on the string? ________ cm
6) How far did the load go up? ___________ cm
7) What advantage is there to using a fixed pulley to lift a load?
2. Moveable pulley

- The wheel moves as the rope is pulled
- **MA = the number of supporting rope segments that lift the resistance**

**Try it:**

1) Get the tray containing the same weight used yesterday.

2) Record the original weight (resistance) calculated on the opposite page. __________ N

3) Unhook the pulley from the ring stand. Attache the string to it. Put the string through the pulley and hook the other end to the scale. Hook the load to the pulley as shown in the diagram above.

4) Pull up on the string so that it is tight and the load is just about to lift off the table. These are your starting points for the distance that the load and effort move. Now, pull the string upwards using the spring scale. How much force was required? _________________ N

5) Calculate the MA of the movable pulley using the same formula as on the front. SHOW YOUR WORK.

6) How far did you pull up on the scale? __________ cm
   How far did the load move up? ____________ cm

7) What advantage(s) are there to a moveable pulley? ____________________________________________
   ____________________________________________
   ____________________________________________

8) What disadvantage(s) are there? ____________________________________________
   ____________________________________________
   ____________________________________________
Is it better to have a pulley where you pull up or down? Why?

Describe how a pulley system works.

How do you determine the mechanical advantage of a pulley system?

Using Gravity

It is Easier to pull down than up

3. Pulley systems
   - Made of the combination of moveable and fixed pulleys
   - Pulleys gain force by having more rope segments hold up the load
   - MA = the number of supporting ropes (the rope with the effort force is not counted)

Determine the MA for the following pulleys:

Try This:

1. Hook a single fixed pulley to the ring stand. Hook one end of the long end of the string to the bottom of the pulley. Feed the string through the other single pulley and up over the fixed pulley. Hook the end of the string to the scale. Hook the moveable pulley to the load.

2. Pull on the scale so that the load is lifted. How much force is needed to lift the load?

   _______ N

3. Using the same direct force as in the 1st set-ups, calculate the M.A. of the pulley system.

   M.A. = ____________
4. What was the distance of the effort? _______ cm

5. What was the distance of the load? _________ cm

6. What advantages does this pulley system have over a moveable pulley alone?

________________________________________________________________

________________________________________________________________________