

Engineering and Design Assignment (See Engineering Design Scoring Guide.)

✓ Always check/mark as you read!

PROBLEM: __ Raise (and deliver) a cargo to a height of at least ____ meters using only hand power from the lower level/location. Speed, smoothness of delivery & appearance are all important.

Criteria: __ 1) Lift distance must be at least ____ meters.
 __ 2) Hand power must remain on lower level.
 __ 3) Cargo options are: 1-5 pennies, a sphere (d => penny), or agreed upon _____ .

Constraints: __ 1) First solution must be a "Friction Rope Climber Elevator" design.
 __ 2) Solution must be easily portable and have minimal set up time.
 __ 3) If time, design & compare a solution using the "Pulley Counterweight Elevator".

Friction Rope Climber Elevator:

Materials:

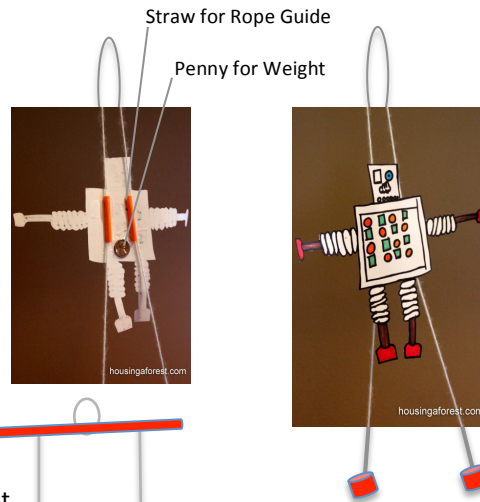
- __ *Climber* of cardboard of your design
- __ 1+ penny or sphere for weight
- __ 1-2 drinking straws for rope guides, ends & bars
- __ Tape only as necessary. Conserve
- __ Rope (string) (2+ meters)
- __ Strength for "bars" of available materials

Construction:

- __ See images for basic start. Refine.
- __ Add a horizontal top bar and/or a lower bar. ↘
- __ Design and add cargo carrier attachment.
 (See *Origami Tote* on Science Home Page → Tools Page.)

Operation:

- __ Hang the loop over a table corner or hook to test.
- __ Alternate as you pull the left rope and right rope to lift the *Climber*.



Pulley Counterweight Elevator:

Materials:

- __ Carrier for cargo (Construct from a poster board, heavy paper or bring your own.)
 (See *Origami Tote* on Science Home Page → Tools Page.)
- __ 1+ grooved wheel/pulley (Bring or design from available materials.) (Ask. I have a few for loan.)
- __ Rope (string) (2+ meters)
- __ Bar for top (Bring one (such as a ruler) or design one from available materials.)
- __ Counterweight (Bring or design from available materials.)

Construction:

- __ See images below for basic start. Choose. Refine.

Operation:

- __ Hang bar over table corner or hook(s) to test.
- __ Move counterweight to move cargo. Counterweight must hold cargo in position.

