



TeachEngineering

STEM Curriculum for K-12

Pulleys and the Pyramids



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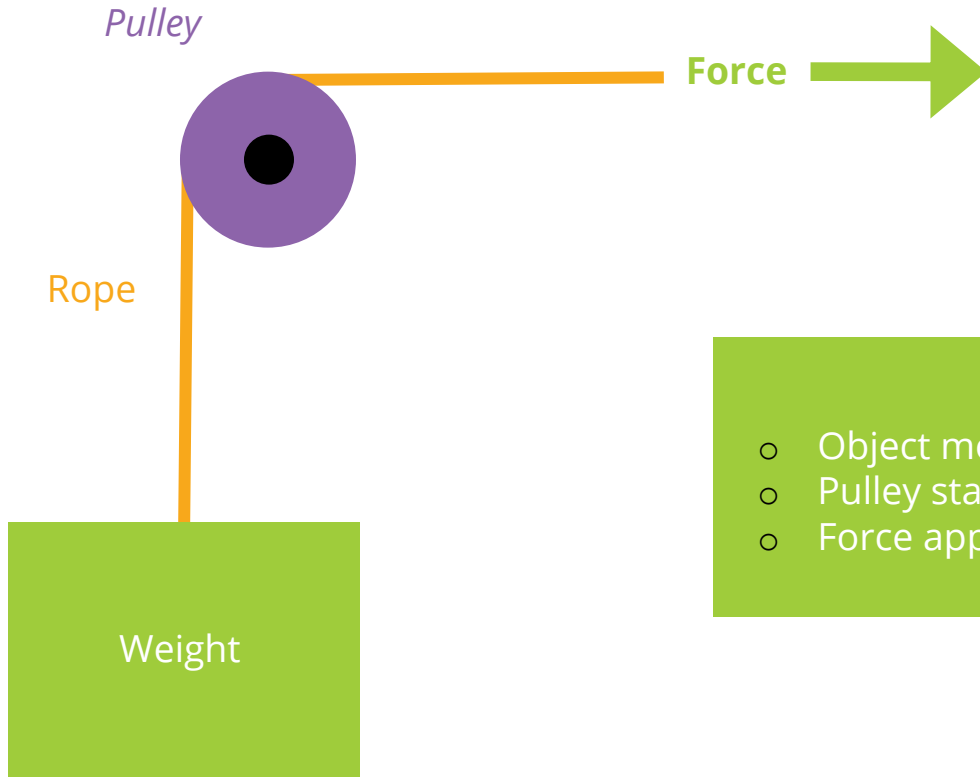


What is a pulley?

- A pulley is a wheel
- A pulley uses rope that goes around the wheel
- The rope attaches to objects
- The other end of the rope has a *force* applied
 - Applied force is a push or a pull



Fixed Pulley



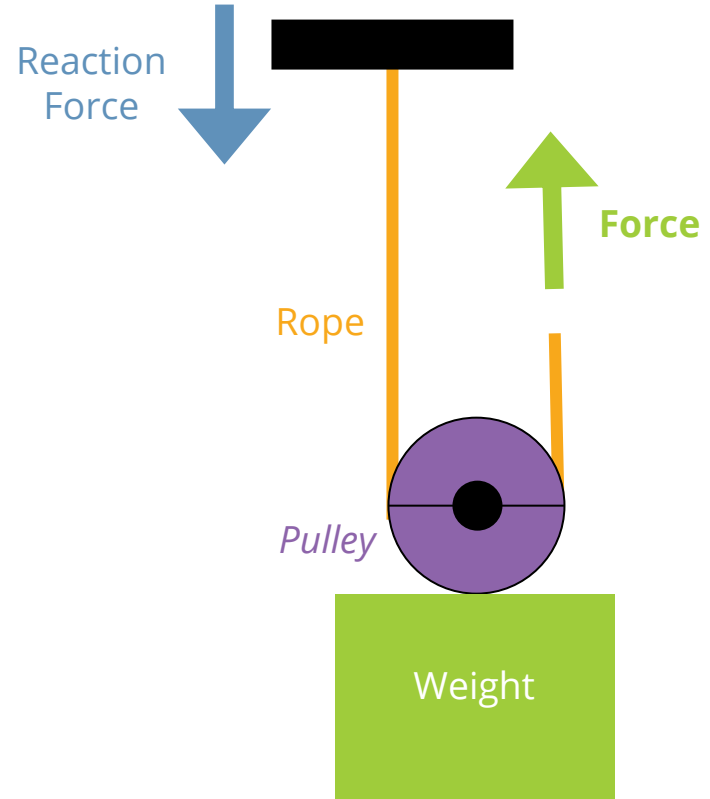
Fixed Pulley

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

Movable Pulley

Movable Pulley

- Pulley is attached to object
- Pulley and object move together
- Rope is attached to something that does not move
- Force applied to other end of rope

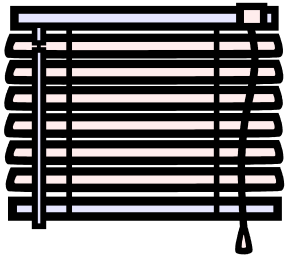


Who has seen pulleys?

...Pulleys are all around us...



Elevator



Window shades
and blinds



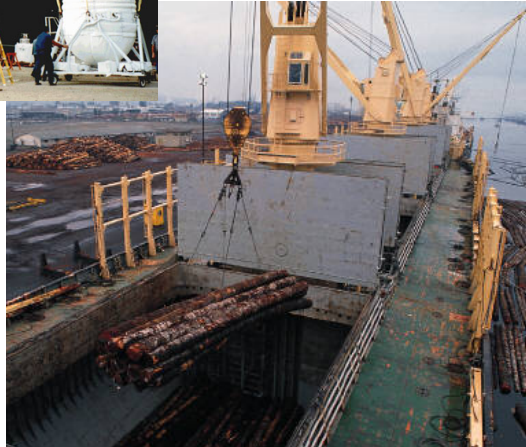
Flagpole



More examples



Cranes



Sails and fishing nets



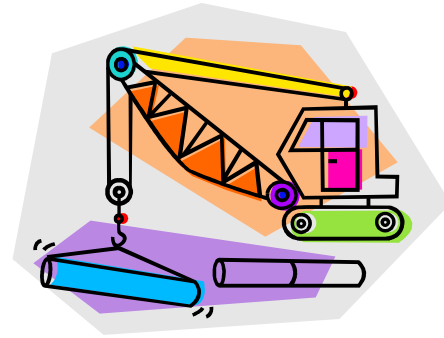
Clothes lines

Gym training equipment

Rock climbing gear

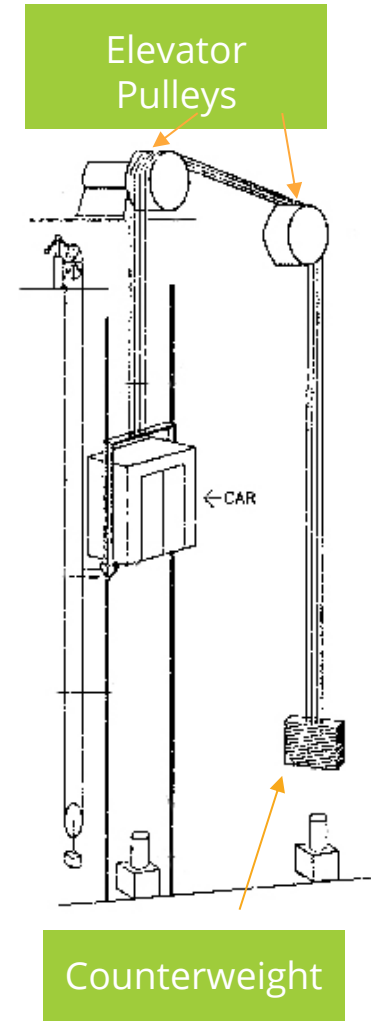
Why use pulleys?

- Makes lifting things easier
- Pulleys *redirect force*
 - Enables us to use gravity to help us (*is it usually easier to pull down to lift something up*)
- Using several pulleys reduces the force required to lift an object
 - We have to use more rope and make the rope go further
 - *Mechanical Advantage*: More distance traveled, but less force required

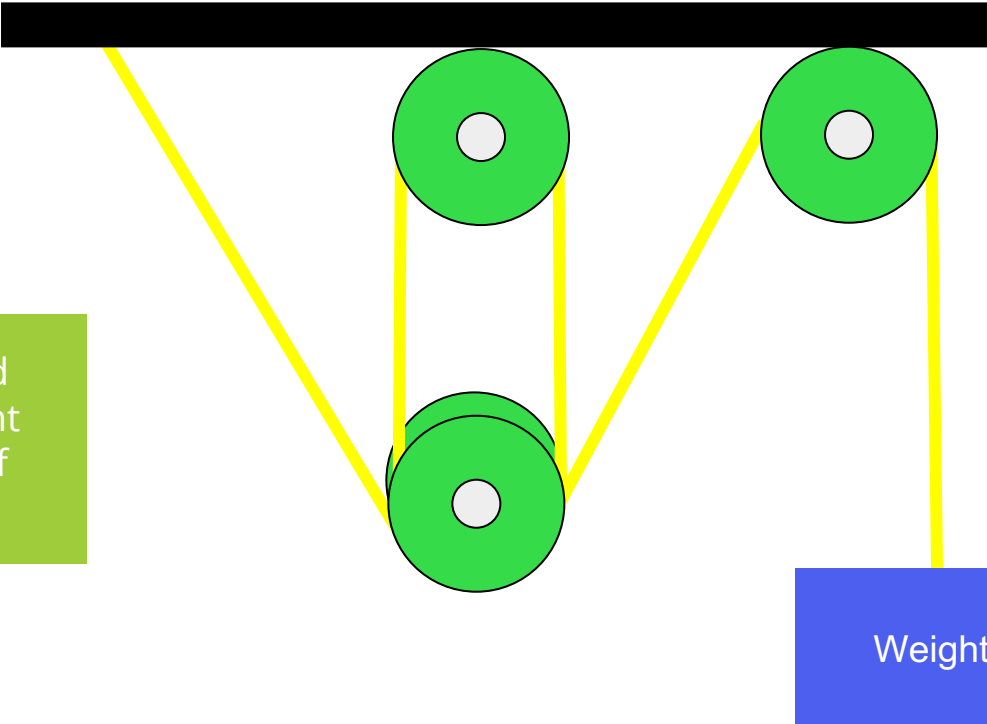


Using Gravity

- Easier to pull down than up
- Elevators use gravity
 - Counterweight on the other side of the cable
 - Gravity already applying force on counterweight
 - Less powerful motor required



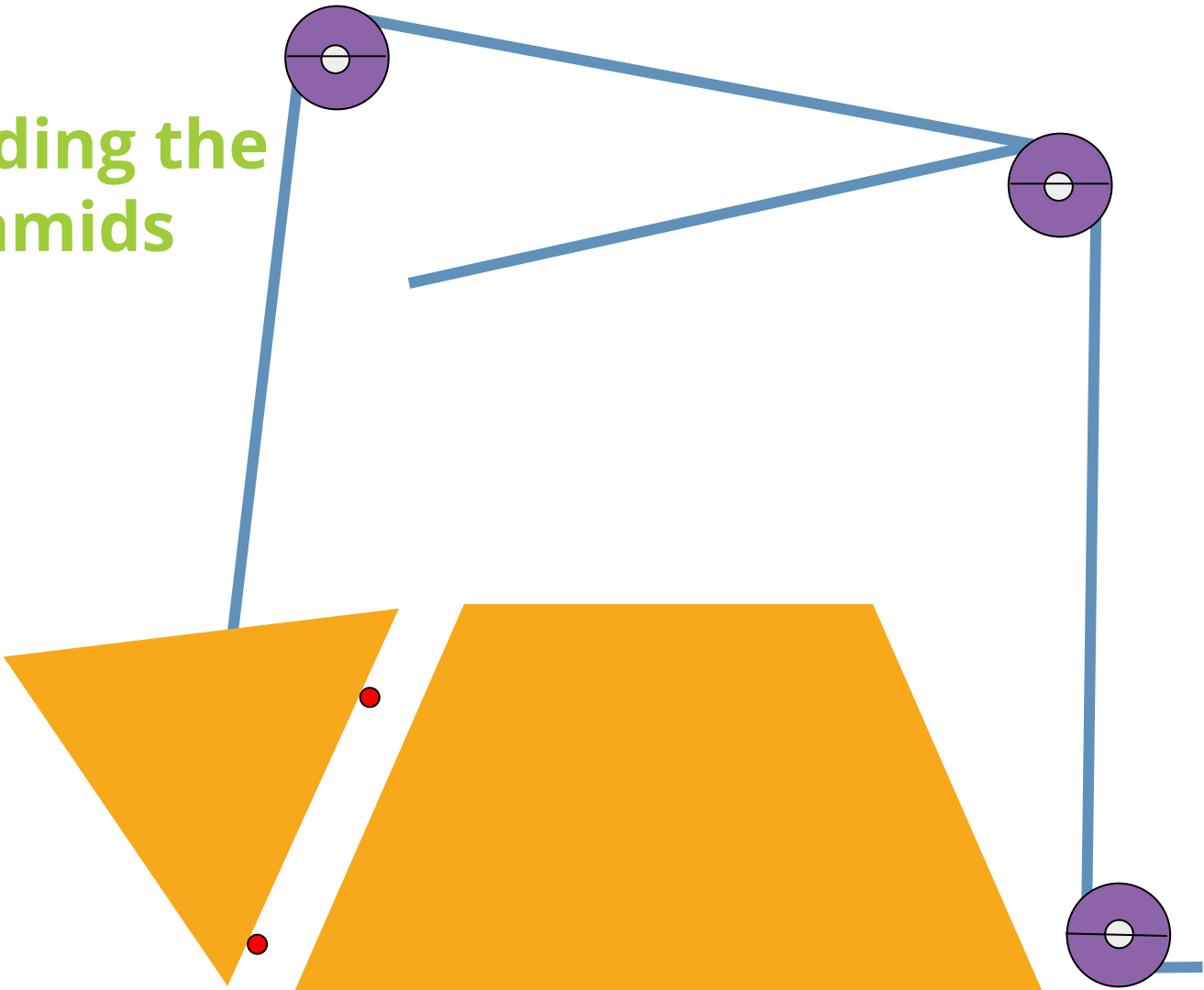
System of Pulleys



The force needed to raise this weight is $\frac{1}{4}$ the weight of the object



Building the Pyramids



Vocabulary & Definitions

Force: A push or a pull on an object

Fixed pulley: A pulley attached to a fixed point with the rope attached to the object

Movable pulley: A pulley attached to the object itself, with one end of the rope attached to a fixed point

Redirect force: To change the direction of a push or pull to gain advantage over a task

Mechanical advantage: The advantage gained by using simple machines; trading distance for force

References

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