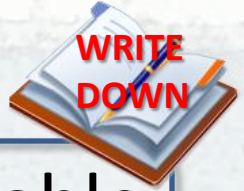




Pulleys

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Definition



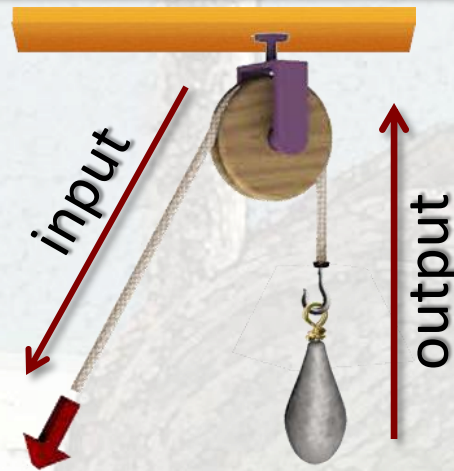
- A pulley is a grooved wheel with rope or cable.



Types of Pulleys



- A fixed pulley is a pulley that doesn't move, and changes the direction of the applied force.
- A moveable pulley is a pulley that is supported by strands of rope along which it slides.



What Gives a Pulley its Mechanical Advantage?

- Imagine twins are holding a 1,000 N weight with a rope.
 - How much force does each twin exert? **500 N**
- Imagine one of the twins is replaced by a tree.
 - How much force does the remaining twin exert? **500 N**
 - What is the mechanical advantage of the rope? **2**
- The number of supporting strands of rope determines the mechanical advantage.



So, What's the Pulley For?

- The mechanical advantage comes from the supporting strands of rope.
- The pulley is a grooved wheel that glides along the rope.
- The pulley reduces friction.

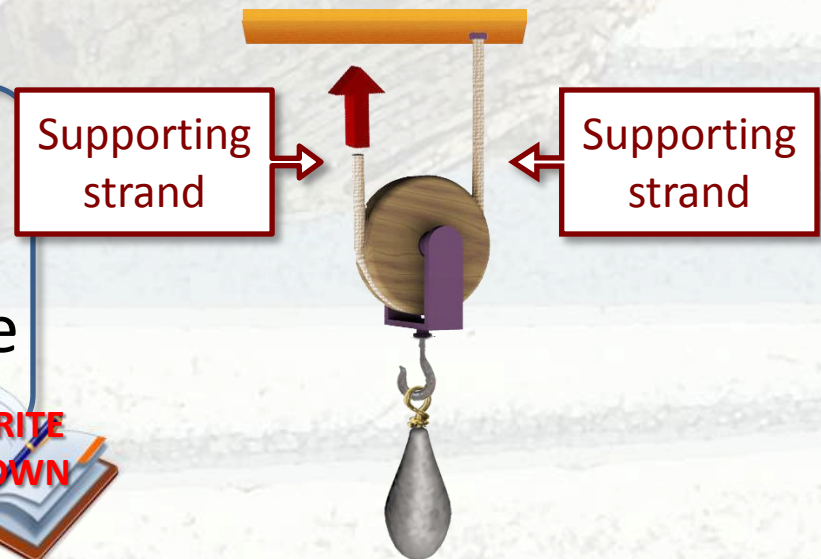


More on Mechanical Advantage?

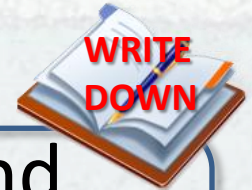
- A fixed pulley has one supporting strand.
 - The mechanical advantage is 1.



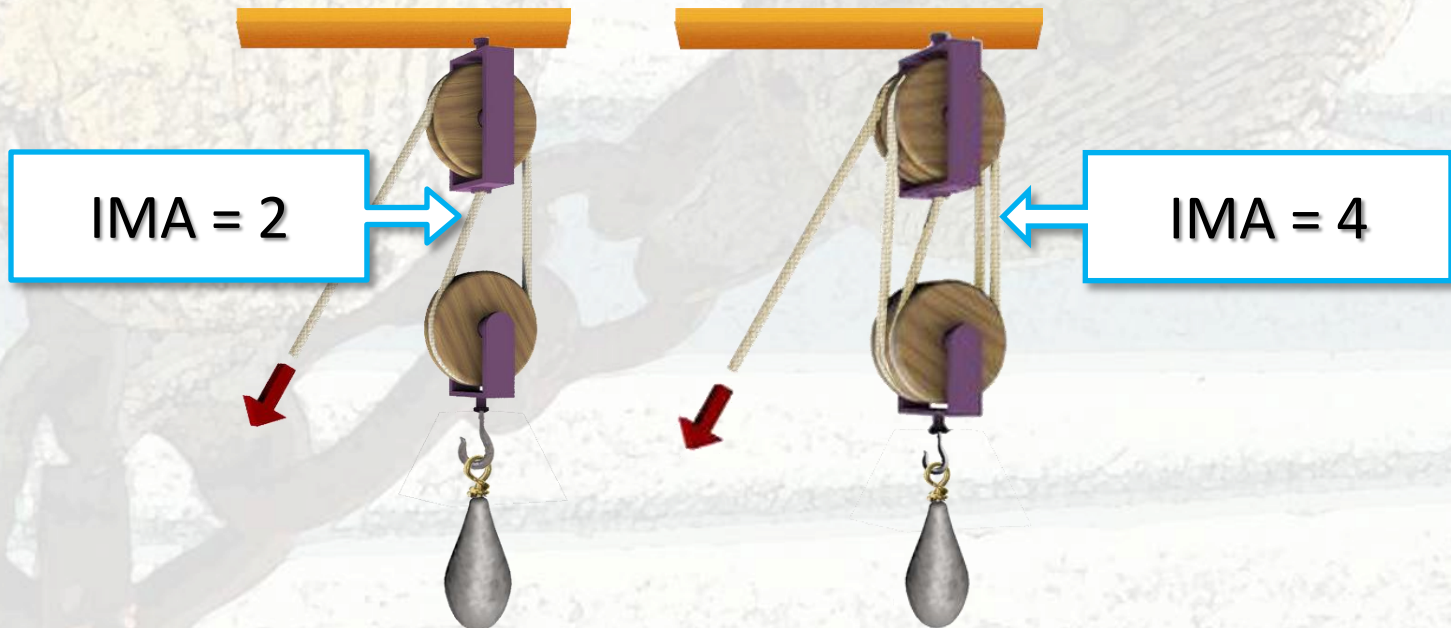
- A moveable pulley has two supporting strands.
 - The mechanical advantage is 2.



Pulley Systems



- A pulley system containing both fixed and moveable pulleys is called a block and tackle.
- The IMA is equal to the number of supporting strands of rope.



Pulley Problems



Refer to the diagram of the pulley system to the right:

- What is the mechanical advantage?

3

- How much force is needed to lift a 60 N load?

$$F_{in} = \frac{F_{out}}{MA} = \frac{60 \text{ N}}{3} = 20 \text{ N}$$



- How much rope will need to be pulled out to lift the load 75 cm?

$$d_{in} = MA \times d_{out} = 3 \times 75 \text{ cm} = 225 \text{ cm}$$

