



TeachEngineering

STEM Curriculum for K-12

Review of Simple Machines



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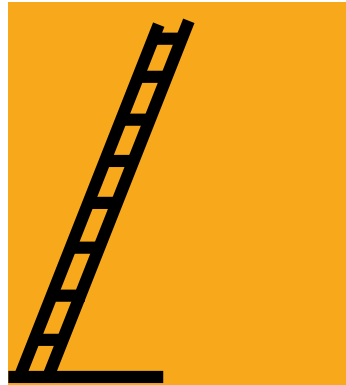
What are they?

Simple machines are machines with few or no moving parts that are used to make work easier!

Why Simple Machines?

For the **mechanical advantage**...

- Making something easier to do, but it takes a little longer to do it
- For example, going up a longer flight of stairs instead of going up a steep ladder



Types of Simple Machines

Wedge

Wheel and Axle

Lever

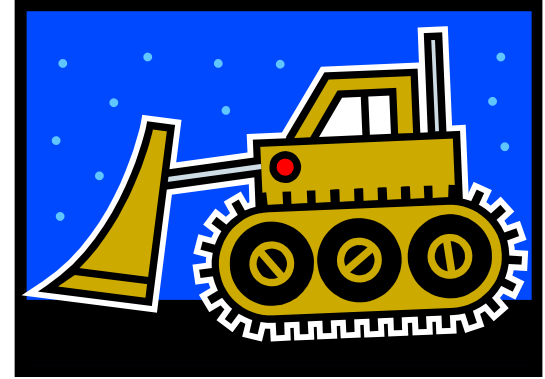
Inclined Plane

Screw

Pulley

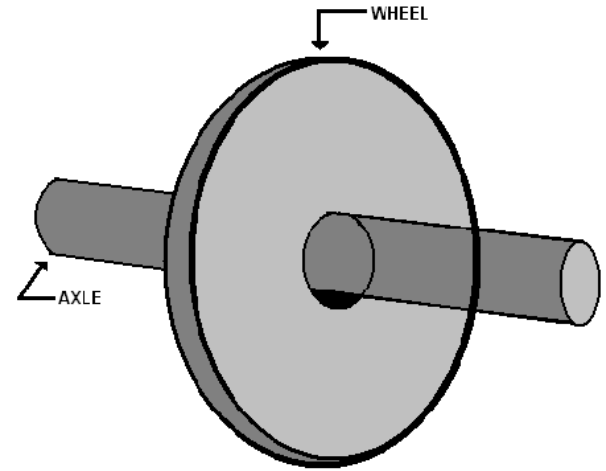
Wedge

- Pushes materials apart, cuts things
- **Examples:** axe, doorstop, chisel, nail, saw, jackhammer, bulldozer, snowplow, zipper, scissors, airplane wing, knife, fork



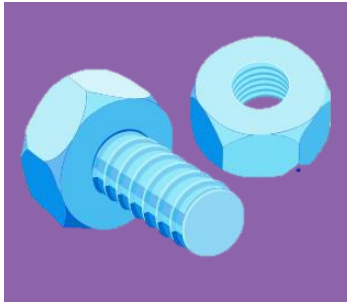
Wheel and Axle

- Makes it easy to move things by rolling them, and reducing friction
- **Examples:** car, bicycle, office chair, wheel barrow, office chair, roller skates, skateboard



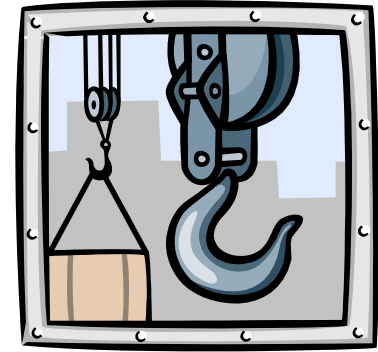
Screw

- Turns rotation into lengthwise movement
- Takes many twists to go a shorter distance
- Holds things together
- **Examples:** screws, bolts, clamps, jar lids, car jack, spinning stools, spiral staircases



Pulley

- Makes lifting things with a rope easier by redirecting force and the addition of additional pulleys
- **Examples:** flag pole, elevator, sails, fishing net, clothes line, crane, window shades and blinds, rock climbing gear

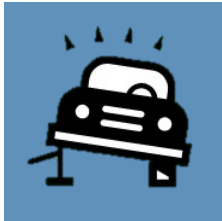


Complex Machines

Combining two or more simple machines to work together

Examples:

- Car jack **combines** wedge and screw
- Crane or tow truck **combines** lever and pulley
- Wheel barrow **combines** wheel and axle with a lever
- Axe **combines** wedge with a lever



Mechanical Advantages

Wedge

Pushes material apart, cuts

Wheel and Axle

Makes it easy to move objects by rolling them, and reducing friction

Lever

Helps lift heavy weights using longer distances

Inclined Plane

Makes it easier to move objects upward; a longer path but easier lifting

Screw

Turns rotation into lengthwise movement

Pulley

Makes lifting heavy objects easier by redirecting force

Engineering Design Process

Ask: Identify the Needs and Constraints: What is the problem? What do I want to do? What are the project requirements? What are the limitations? Who is the customer? What is the goal?

Research the Problem: Gather information and research what others have done. Talk to people from many different backgrounds and specialties to assist with researching what products or solutions already exist, or what technologies might be adaptable to your needs.

Imagine: Develop Possible Solutions: You work with a team to brainstorm ideas and develop as many solutions as possible. This is the time to encourage wild ideas and defer judgment! Build on the ideas of others! Stay focused on topic, and have one conversation at a time! Remember: good design is all about teamwork!

Plan: Select a Promising Idea: Revisit the needs, constraints and research from the earlier steps, compare your best ideas, select one solution and make a plan to move forward with it.

Create: Build a Prototype: Building a prototype makes your ideas real! These early versions of the design solution help your team verify whether the design meets the original challenge objectives. Push yourself for creativity, imagination and excellence in design.

Test and Evaluate Prototype: Does it work? Does it solve the need? Communicate the results and get feedback. Analyze and talk about what works, what doesn't and what could be improved.

Improve: Redesign as Needed: Discuss how you could improve your solution. Make revisions. Draw new designs. Iterate your design to make your product the best it can be.

And now, **REPEAT!**

References

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