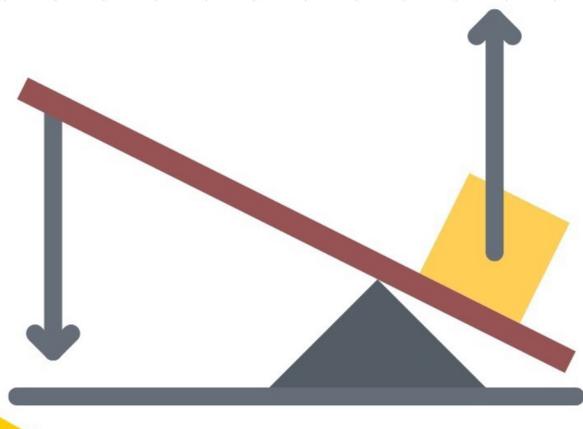


# Simple Mechanics

Unit 3  
Session 5

## Introduction

- Simple Machine
- Working with Simple Machine
- Difference between Machine and Simple Machine



- 1) What are some examples of simple machines used in everyday life?
- 2) What simple machines can you make at home?
- 3) What are the machines used in the home?



## Lesson Aims:

- 1) Understand what a simple machine is and how it would help an engineer to build something.  
Identify six types of simple machines.
- 2) Understand how the same physical principles used by engineers today to build skyscrapers were employed in ancient times by engineers to build pyramids.
- 3) Generate and compare multiple possible solutions to creating a simple lever machine based on how well each met the constraints of the challenge.



# SIMPLE MACHINE

Simple machines are devices with few or no moving parts that make work easier. Students are introduced to the six types of simple machines – the wedge, wheel and axle, lever, inclined plane, screw, and pulley – in the context of the construction of a pyramid, gaining high-level insights into tools that have been used since ancient times and are still in use today. Use Reference [1-6] for illustration by scanning the QR code given in the end.

**Design:** (verb) To plan out in the systematic, often graphic form. To create for a particular purpose or effect. Design a building. (noun) A well-thought-out plan.

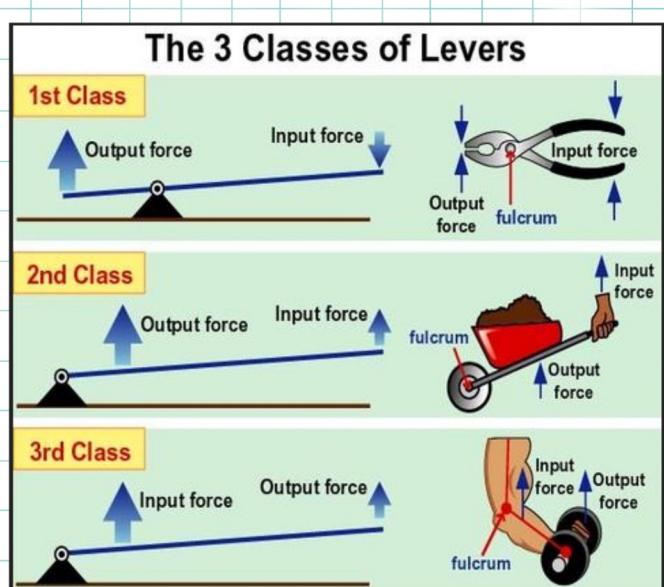
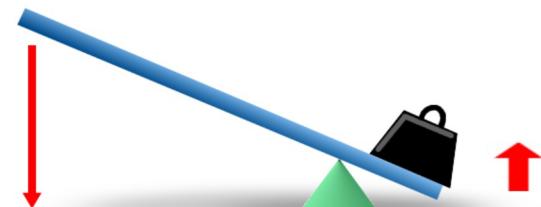
**Engineering:** Applying scientific and mathematical principles to practical ends such as the design, manufacture, and operation of efficient and economical structures, machines, processes, and systems.

**Force:** A push or pull on an object.

**Inclined plane:** A simple machine that raises an object to a greater height. Usually, a straight slanted surface and no moving parts, such as a ramp, sloping road, or stairs.

**Lever:** A simple machine that increases or decreases the force to lift something. Usually, a bar pivoted on a fixed point (fulcrum) to which force is applied to do work.

**Mechanical advantage:** An advantage gained by using simple machines to accomplish work with less effort. Making the task easier (which means it requires less force), but may require more time or room to work (more distance, rope, etc.). For example, applying a smaller force over a longer distance to achieve the same effect as applying a large force over a small distance. The ratio of the output force exerted by a machine to the input force applied to it. Use reference[7] for illustration by scanning the QR code.



**Pulley:** A simple machine that changes the direction of a force, often to lift a load. Usually consists of a grooved wheel in which a pulled rope or chain runs. Use reference[8] for illustration

**Screw:** A simple machine that lifts or holds materials together. Often a cylindrical rod is incised with a spiral thread.

**Simple machine:** A machine with few or no moving parts that are used to make work easier (provides a mechanical advantage). For example, a wedge, wheel, and axle, lever, inclined plane, screw, or pulley.

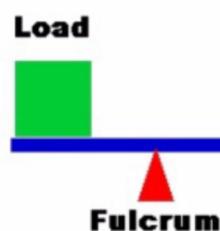
**Spiral:** A curve that winds around a fixed center point (or axis) at a continuously increasing or decreasing distance from that point.

**tool:** A device used to do work.

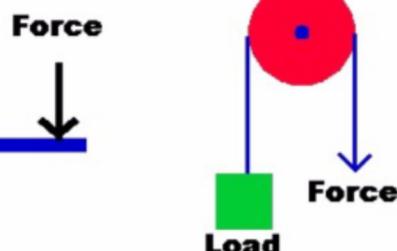
**wedge:** A simple machine that forces materials apart. Used for splitting, tightening, securing, or levering. It is thick at one end and tapered to a thin edge at the other.

**wheel and axle:** A simple machine that reduces the friction of moving by rolling. A wheel is a disk designed to turn around an axle passed through the center of the wheel. An axle is a supporting cylinder on which a wheel or a set of wheels revolves.

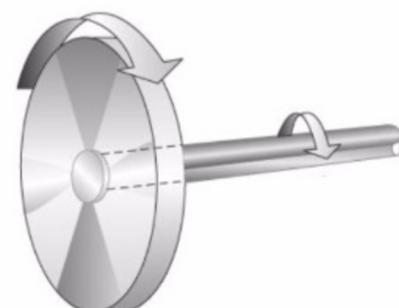
**work:** Force on an object multiplied by the distance it moves.  $W = F \times d$  (force multiplied by distance).



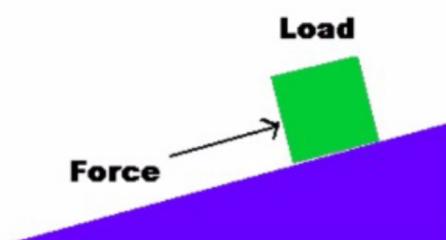
Lever



Pulley



Wheel & Axle



Inclined Plane



Wedge



Screw

# WORKING OF SIMPLE MACHINES

Use the attached Introduction to Simple Machines PowerPoint presentation [10] and Simple Machines Reference Sheet [9] by scanning the QR code as helpful classroom tools. (Show the PowerPoint presentation, or print out the slides to use with an overhead projector. The presentation is animated to promote an inquiry-based style; each click reveals a new point about each machine; have students suggest characteristics and examples before you reveal them.)

Simple machines are everywhere; we use them every day to perform simple tasks. Simple machines have also been in use since the early days of human existence. While simple machines take many shapes, they come in six basic types:

**Wedge:** A device that forces things apart.

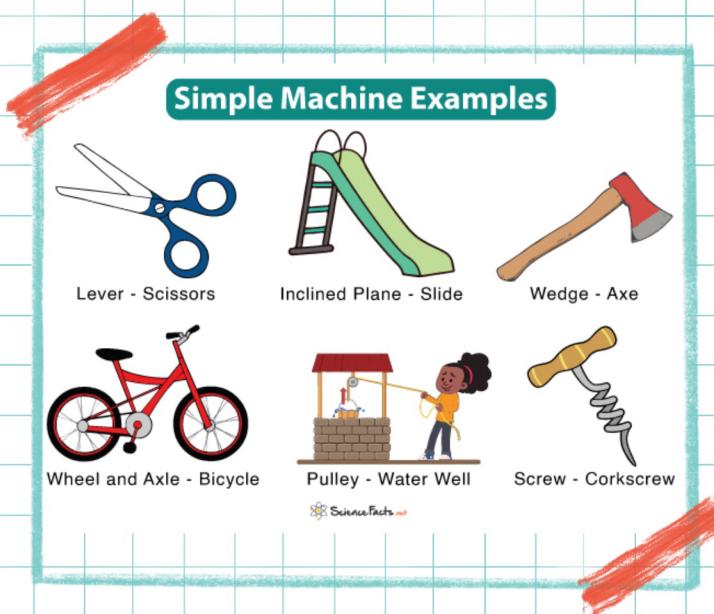
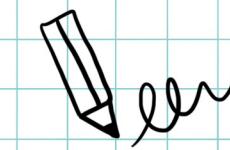
**Wheel and axle:** Used to reduce friction.

**Lever:** Moves around a pivot point to increase or decrease mechanical advantage.

**Inclined plane:** Raises objects by moving up a slope.

**Screw:** A device that can lift or hold things together.

**Pulley:** Changes the direction of a force.



**Lever**



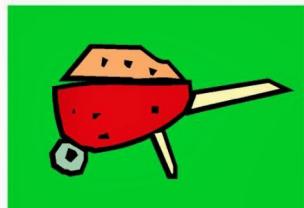
**Inclined Plane**



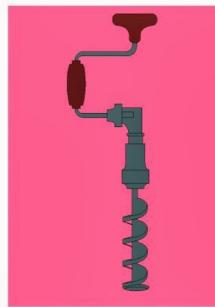
**Wedge**



**Pulley**



**Wheel and Axle**



**Screw**

# ACTIVITY

## Practical on Machines and Pully:

Pulley: blinds, garage doors, flag poles.

Lever: see saw, pry bar, lever action door latches.

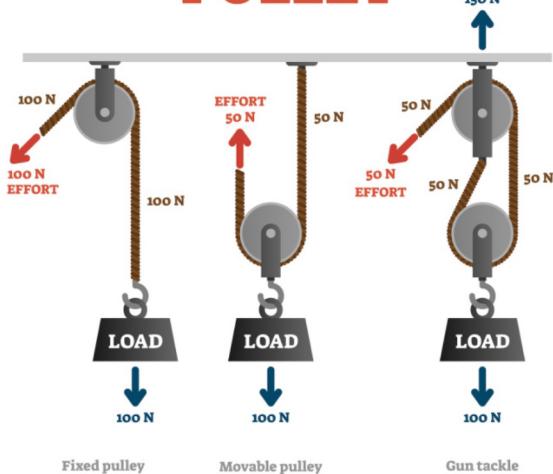
Wedge: scissors, screw, a knife.

Wheel and axle: office chairs, carts, wheeled carry-on luggage, and toy cars.

## How to make a Simple Pulley System

- 1) Punch three holes into the applesauce cup.
- 2) Cut three pieces of yarn the same length.
- 3) Tie one end of each of the pieces of yarn through a hole in the cup.
- 4) Tie the loose ends of the yarn together.
- 5) Tie a really long piece of yarn to the three pieces you just tied together.
- 6) Tape the other end of the long piece of yarn to the inside of the ribbon spool.
- 7) Wrap the yarn around the ribbon spool.
- 8) Place a band-aid at each end of the chopstick. The band-aids will keep the chopstick from rubbing against the wood of the banister or where ever you secure the pulley.
- 9) Slide the ribbon spool onto the chopstick.
- 10) Find a location to use your pulley. The length of your chopsticks may determine that.

## PULLEY



## REFLECTION

## FOR MORE INFORMATION -

**1) How do you make a simple machine project?**

**2) What are the 6 simple machines and what do they do?**

**3) What are 3 things a simple machine can do?**

**(by increasing the distance through which force is applied, changing the direction of applied force, or multiplying the force or speed of the energy applied.)**

**4) What are simple machines at home?**

**Example of a simple machine used in everyday life.**

**5) Is scissors a simple machine?**

**If yes, then ask them if different objects work on a similar principle.**

