Simple Machines

Guide for Reading

◆ What are the six types of simple machines?

There are six basic types of simple machines: the inclined plane, the wedge, the screw, the lever, the wheel and axle, and the pulley.

An **inclined plane** is a flat, slanted surface. An inclined plane multiplies your input force by allowing you to exert it over a longer distance. **You can determine the ideal mechanical advantage of an inclined plane by dividing the length of the incline by its height.** You can increase the efficiency of an inclined plane by decreasing friction.

A **wedge** is a device that is thick at one end and tapers to a thin edge at the other end. For a wedge, the ideal mechanical advantage is equal to the length of the wedge divided by its width at the thick end.

A **screw** can be thought of as an inclined plane wrapped around a central cylinder, forming a spiral. This spiral inclined plane forms the threads of the screw. The ideal mechanical advantage of a screw is equal to the circumference of the top of the screw divided by the distance between the threads.

A **lever** is a rigid bar that is free to pivot, or rotate, about a fixed point. The fixed point that a lever rotates around is called the **fulcrum. You can calculate the ideal mechanical advantage of a lever as the distance from the fulcrum to the input force divided by the distance from the fulcrum to the output force.**

A **wheel and axle** is a simple machine made of two circular or cylindrical objects that are fastened together and that rotate about a common axis. The larger object is called the wheel and the smaller object is called the axle. **You can calculate the ideal mechanical advantage of a wheel and axle as the radius of the wheel divided by the radius of the axle.**

A **pulley** consists of a rope or chain that is wrapped around a grooved wheel. A pulley that you attach to a structure is called a fixed pulley. If you attach a pulley to the object you wish to move you are using a moveable pulley. Several pulleys can be combined to make a pulley system, or "block and tackle." **The ideal mechanical advantage of a pulley system is equal to the number of sections of rope that support the object.**

More complex machines consist of combinations of simple machines. A machine that utilizes two or more simple machines is called a **compound machine.** For example, a mechanical pencil sharpener uses a system of **gears**, which turn the cutting wheels. Gears are toothed wheels that fit into one another. Gears form a compound machine with one wheel and axle linked to another wheel and axle.
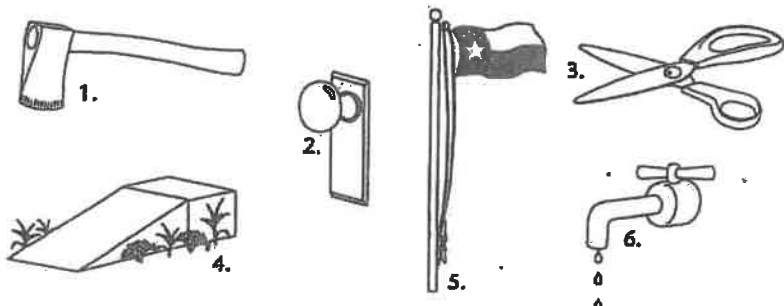
Motion, Forces, and Energy

Simple Machines

◆ Understanding Main Ideas

Write the type of simple machine shown in the diagram on the line by its number.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

◆ Building Vocabulary

From the list below, choose the term that best completes each sentence.

inclined plane   screw   fulcrum
pulley   gear   wedge
lever   wheel and axle   compound machine

7. A(n) _____ is a machine made from two or more simple machines.

8. A seesaw is an example of a simple machine called a(n) _____ .

9. A rope or chain wrapped around a grooved wheel is called a(n)

_____ .

10. A toothed wheel that fits into other toothed wheels is called a(n)

_____ .

11. A(n) _____ is an inclined plane wrapped around a central cylinder to form a spiral.

12. A(n) _____ is a flat, slanted surface.

13. A lever rotates around a fixed point called the _____ .

14. A(n) _____ is thick on one end and tapers to a thin edge at the other end.

15. A screwdriver is an example of a simple machine called a(n)

_____ .