

The 6 Simple Machines

How do machines make work easier?

Simple Machines get the same work done by reducing the size of the force needed by increasing the distance.

Inclined Plane



Screw



Wedge



Pulley



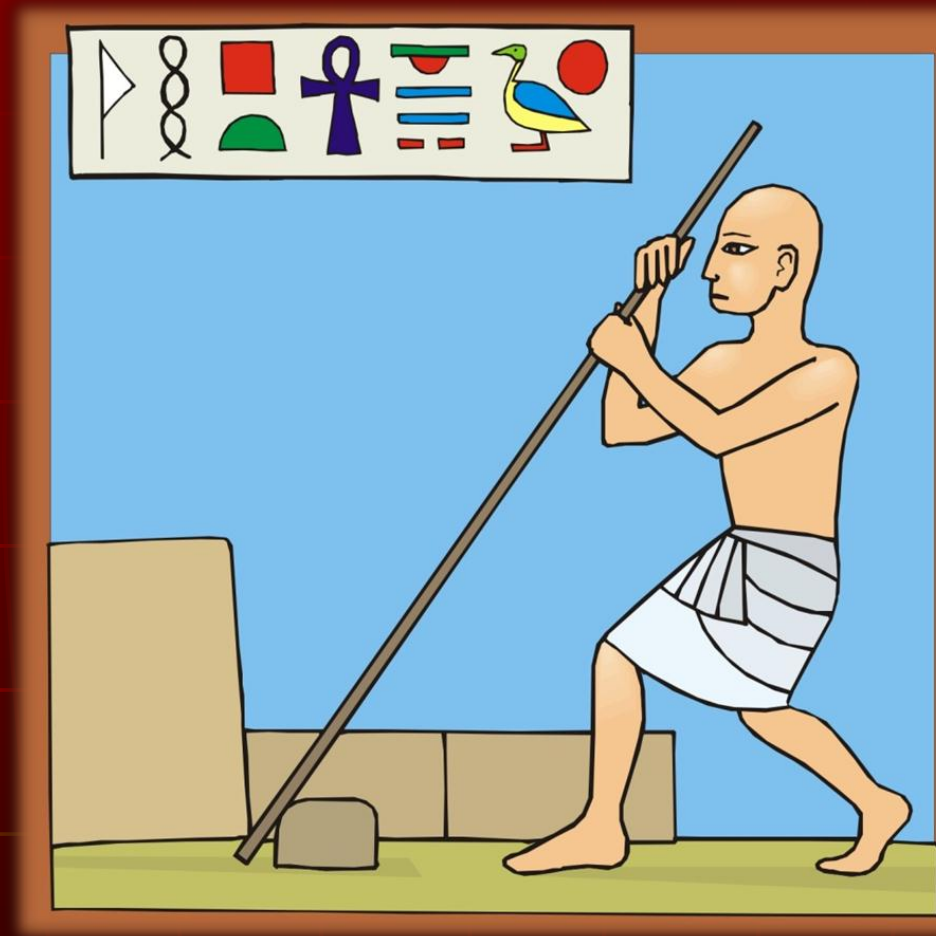
Wheel and Axle



Lever



Simple Machines



Simple machines make work easier for us by allowing us to push or pull over increased distances

Simple Machines Booklet Project

- Fold 2 pieces of blank paper in half to make an 8 page booklet.
- Format: (24 AP; 3 points per page)
 - Page 1 – Cover Page
 - Title, Colored Illustration, Author Information (name and period)
 - Page 2 – Inclined Plane
 - Page 3 – Lever
 - Page 4 – Pulley
 - Page 5 – Screw
 - Page 6 – Wedge
 - Page 7 – Wheel & Axle
 - Page 8 – Definitions
 - Define Energy, Work, Force, Machine, Complex Machine, Technology, Mechanical Advantage, and Efficiency

For Pages 2 – 7

On each page, provide an illustration of an example, definition, and a descriptive caption explaining how the simple machine makes work easier (20 word min).

Definitions:

- Energy: The ability to do work
 - Measured in Joules

- $Work = Force \times Distance$
 - Measured in Joules

- Force: A push or a pull
 - Measured in Newtons

How do machines help you do work?

- **Machine**-any device that helps people do work.
 - Examples
- **Technology**-the use of knowledge to create products or tools that make life easier.
 - Humans have been improving their lives for thousands of years with technology.
 - The simplest machine is an example of technology.

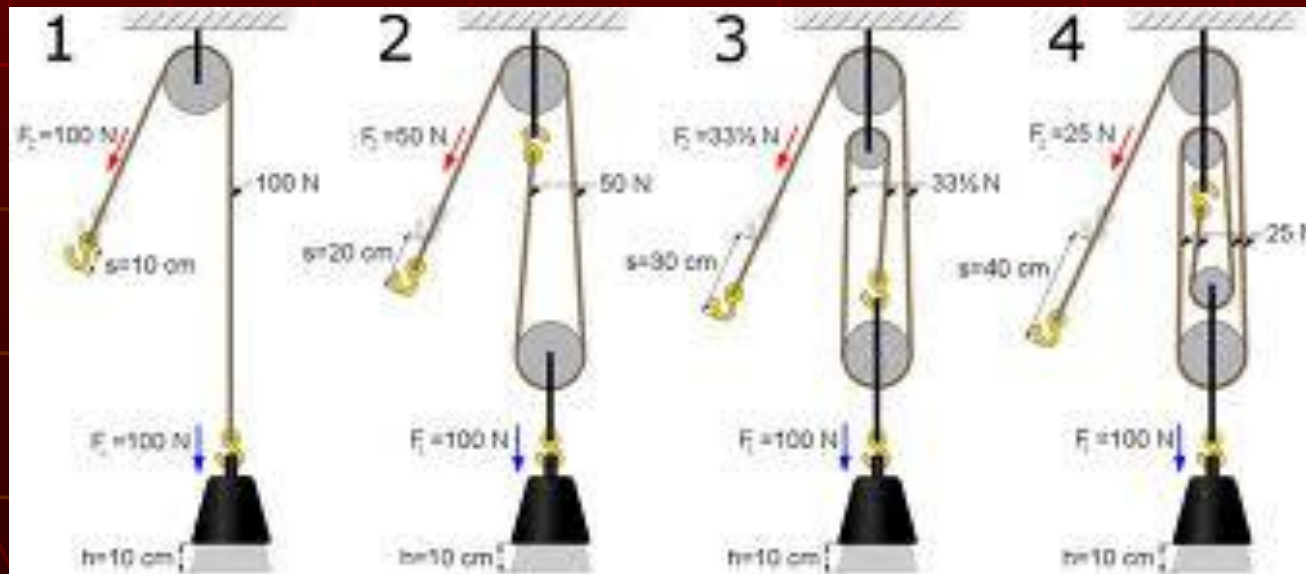
How do machines help you do work?

- Machines make work easier by
 - (1) changing the size of the **force** needed or by
 - (2) changing the **direction** in which the force is exerted

1 pulley
 $W = Fd$

More distance so less force

Much easier than lifting



4 pulleys
 $W = Fd$

More distance so less force

Very little force need

The 6 Simple Machines

Inclined Plane



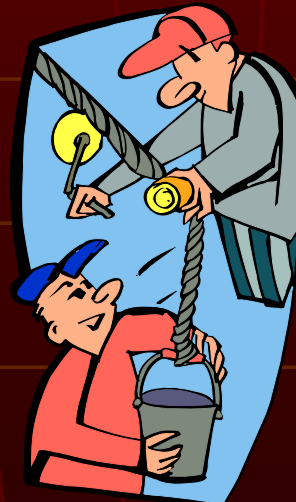
Screw



Wedge



Pulley



Wheel and Axle



Lever

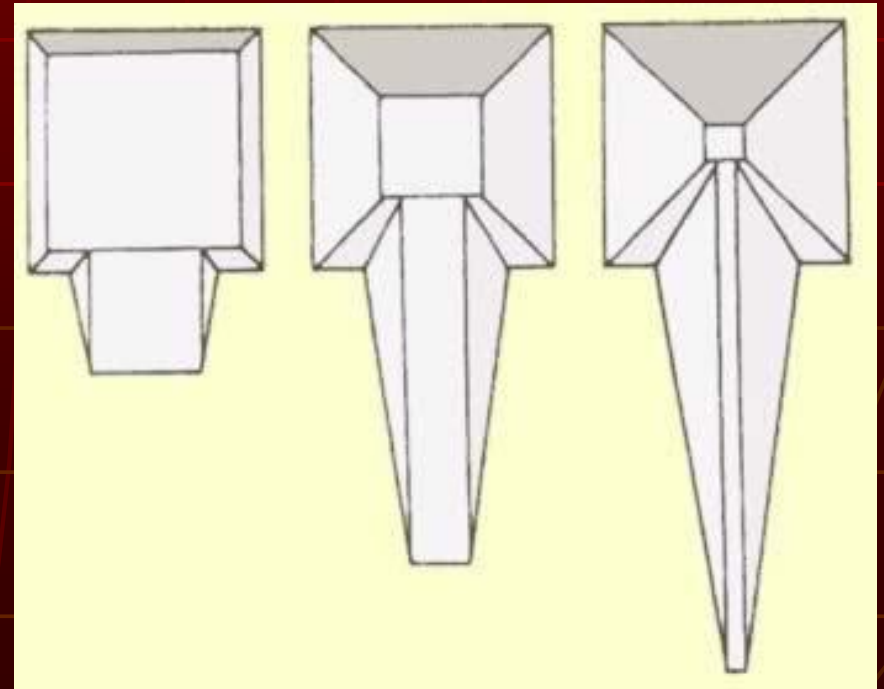
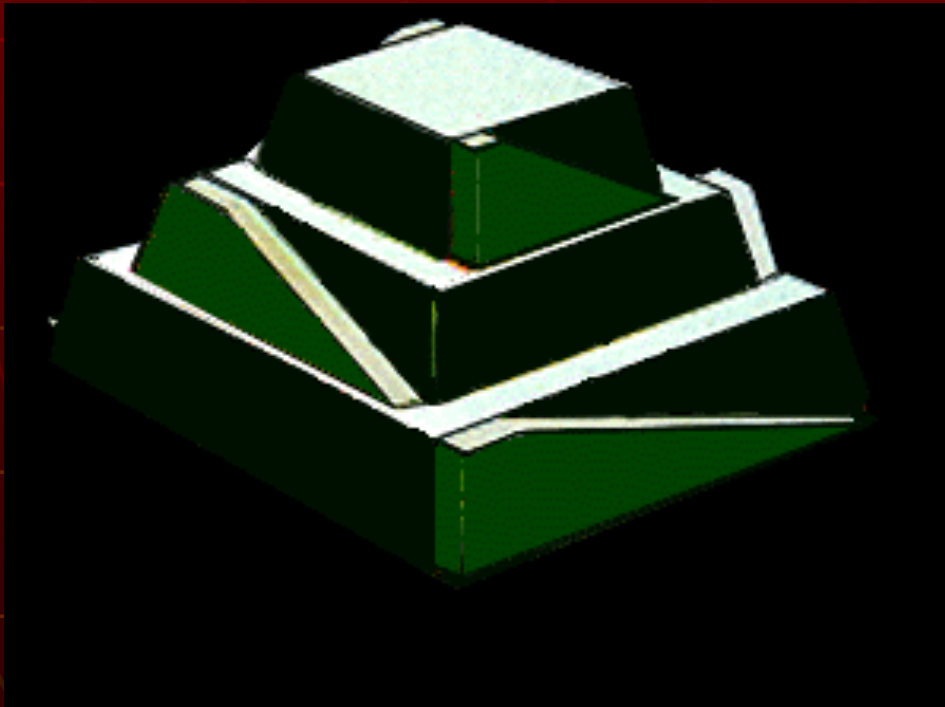


Inclined Plane



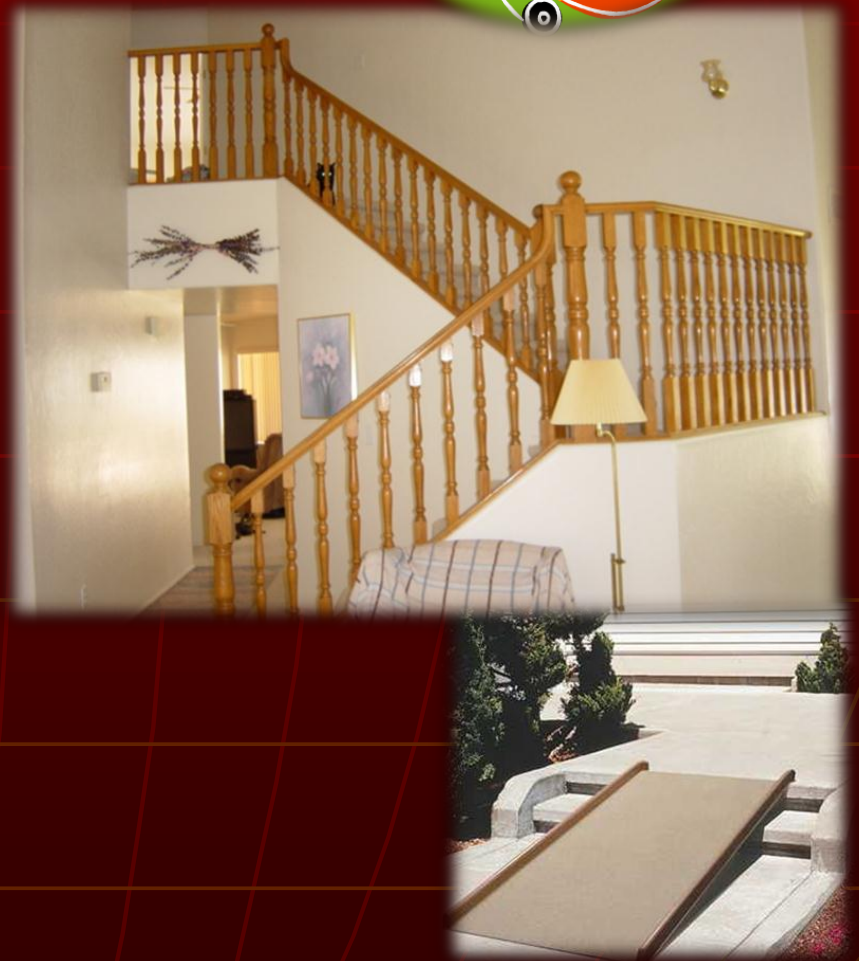
Inclined Plane

- The Egyptians used simple machines to build the pyramids. One method was to build a very long incline out of dirt that rose upward to the top of the pyramid. Then blocks of stone were placed on large logs (another type of simple machine - the wheel and axle) and pushed slowly up the long inclined plane to the top of the pyramid.



Inclined Planes

- Inclined plane - a simple machine that is a sloping surface.
- $W = Fd$
- Makes work easier by increasing the distance
- The lower the slope of a ramp the less force needed to lift the object.

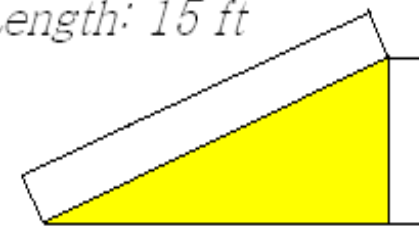


Inclined Plane – Mechanical Advantage

- ★ The mechanical advantage of an inclined plane is equal to the length of the slope divided by the height of the inclined plane.
- ★ While the inclined plane produces a mechanical advantage, it does so by increasing the distance through which the force must move.

THE INCLINED PLANE

Length: 15 ft



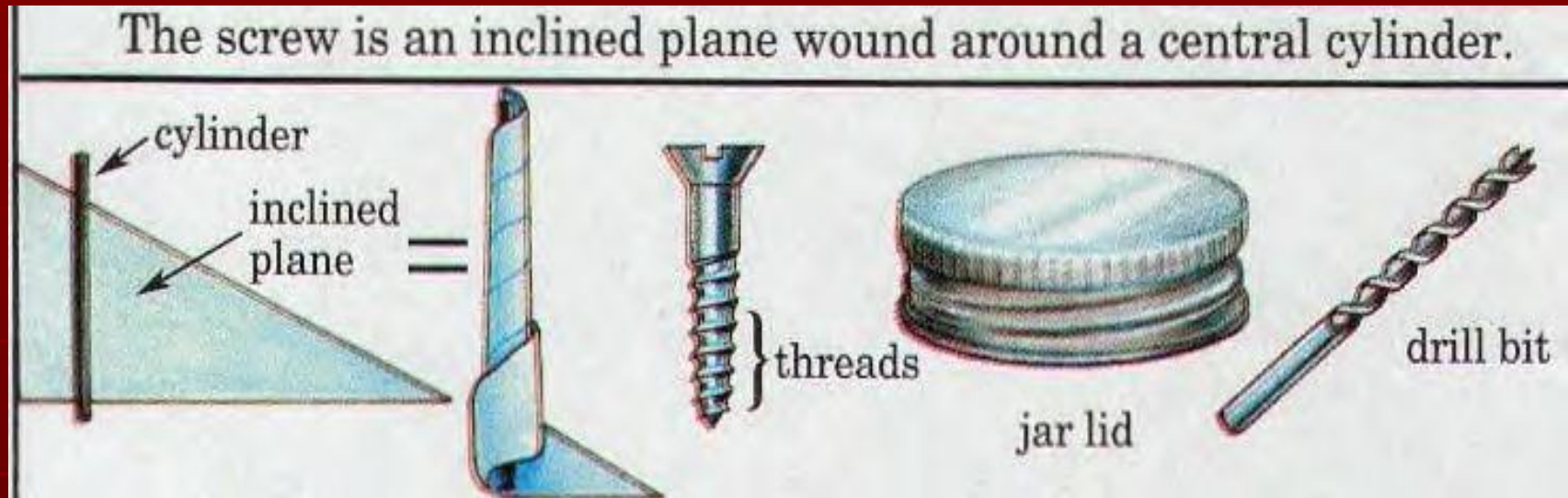
height: 3 ft.

$$MA = \text{length} \div \text{height}$$

$$MA = 15/3$$

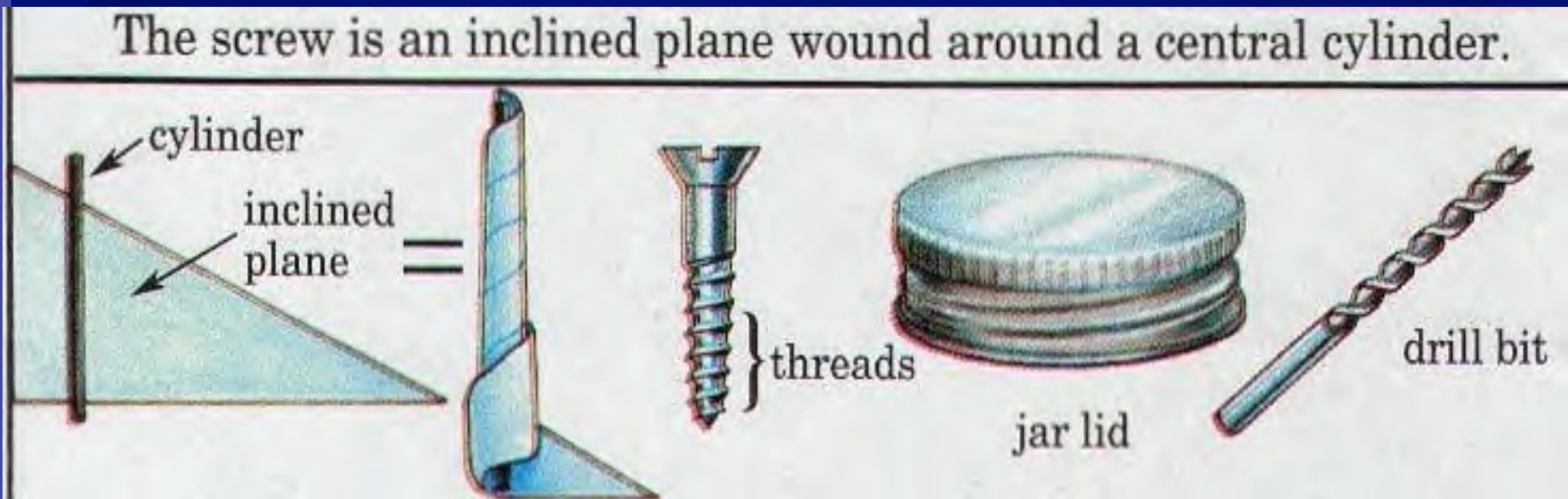
$$MA = 5$$

Screw



- The screw is an inclined plane wrapped around a cylinder or cone to form a spiral.
- It is used to raise and lower weights and hold objects together.
- Examples are drills, jar lids, nuts and bolts.
- The spiraling inclined plane that sticks out from the body of the screw forms the threads of the screw.
- The threads increase the distance, which decreases the force needed to turn the screw.

Screw



The mechanical advantage of an screw can be calculated by dividing the circumference by the pitch of the screw.

Pitch equals $1 / \text{number of turns per inch}$.

Wedges

- Two inclined planes joined back to back
- Wedges are used to split or hold objects together
- Examples: axe blade, knife, chisel, door jam
- The thinner the wedge, the less force is needed to press it into something (knife)
- Small surface area means greater pressure
 - Thinner blades have greater pressure



Wedge – Mechanical Advantage

- ✦ The mechanical advantage of a wedge can be found by dividing the length of either slope (S) by the thickness (T) of the big end.



- ✦ As an example, assume that the length of the slope is 10 inches and the thickness is 4 inches. The mechanical advantage is equal to $10/4$ or $2 \frac{1}{2}$. As with the inclined plane, the mechanical advantage gained by using a wedge requires a corresponding increase in distance.