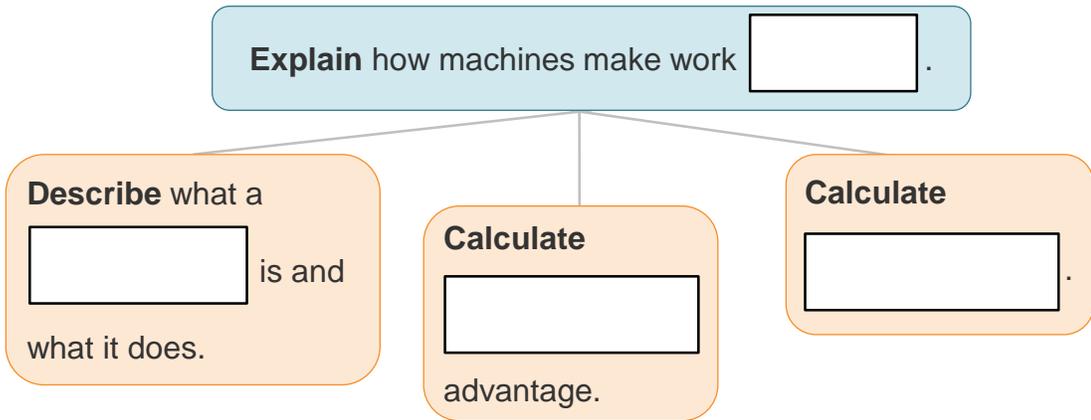




Lesson Question



Lesson Goals



Words to Know

Write the letter of the definition next to the matching word as you work through the lesson. You may use the glossary to help you.

- | | |
|----------------------------|---|
| _____ input | A. a comparison of two amounts calculated by dividing one amount by the other |
| _____ output | B. the amount of something put into a machine or system |
| _____ ratio | C. the amount of something that comes out of a machine or system |
| _____ efficiency | D. the ratio of output force to input force |
| _____ machine | E. the ratio of output work to input work expressed as a percentage |
| _____ mechanical advantage | F. a device that makes work easier |

**Work**

- Work is done by a on an object.
- For work to be done, the object must in the direction of the force.
- The formula for work is .
- Work is measured in (J).

Slide

2

Machines and Work

- A is any device that makes work easier.
- Machines change the way a force is .
- Machines do not change the amount of done.

- A machine makes work by changing:
 - the of a force.
 - the of force exerted.
 - the over which a force is exerted.

5

Inputs and Outputs

- The force applied to a machine is the force.
- The force the machine applies on an object is the force.
- Input work is the amount of work done on a .
- Output work is the amount of work the machine does on an .

Slide

5

Mechanical Advantage

- The number of times a machine increases the input force is known as its .
- A is the comparison of two amounts calculated by dividing one amount by the other.
- Mechanical advantage is the of output force to input force.

$$\text{mechanical advantage} = \frac{\text{output force}}{\text{input force}}$$

Mechanical Advantage: Example

Nina pulls on the handle of a hammer with a of 15 N. The claw end of the hammer exerts a force of 90 N on a nail. What is the mechanical advantage of the hammer?

MA =

Slide

7

Input and Output Forces

- When mechanical advantage and input force are known, the force can be calculated.
- When mechanical advantage and output force are known, the force can be calculated.
- **Example:** A machine has a mechanical advantage of 2.7. What input force is needed to create an of 1,350 N?
input force =

10

Machines and Friction

- The output work of a machine can never be than the input work.
- uses some of the input work.
 - The output work can be by reducing the amount of friction.

Slide

10

Efficiency

- The ratio of the output work to input work is the machine's .
- Efficiency is expressed as a .
- Some work is always lost to friction, so efficiency is always than .

$$\text{efficiency} = \frac{\text{output work}}{\text{input work}} \times 100\%$$

Efficiency: Example

An Olympic bicyclist does 7,500 J of work on his bike while the bike does 7,350 J of work. What is the efficiency of the bike?

efficiency =

Summary

Introduction to Machines



Lesson Question

How do machines make work easier?



Answer

Slide



Review: Key Concepts

- Machines make work easier by changing the way a is applied.
- A machine can change:
 - the of a force.
 - the of force applied.
 - the over which a force is applied.
- Machines do not change the amount of done.

	Definition	Equation
Mechanical advantage	The ratio of a machine's output force to input force	Mechanical advantage = <input type="text"/>
Efficiency	The ratio of a machine's output work to input work expressed as a percentage	efficiency = <input type="text"/>



Summary

Introduction to Machines

Use this space to write any questions or thoughts about this lesson.