Illuminate NEBRASKA
POWERED BY NEBRASKA PUBLIC POWER DISTRICT

POWER VS. WORK

CALCULATING WORK-ENERGY-POWER

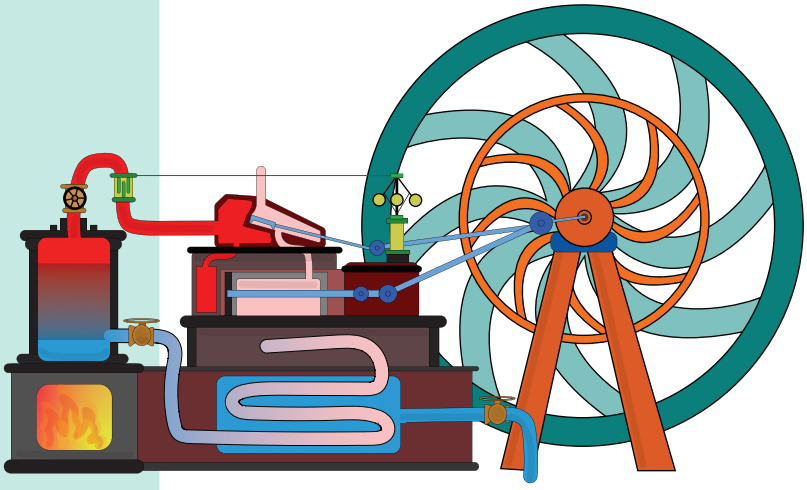
CONCEPT Power and work are two related but distinct concepts in physics. Work is the energy transferred to or from an object by a force acting on it, while power is the rate at which work is done or energy is transferred.

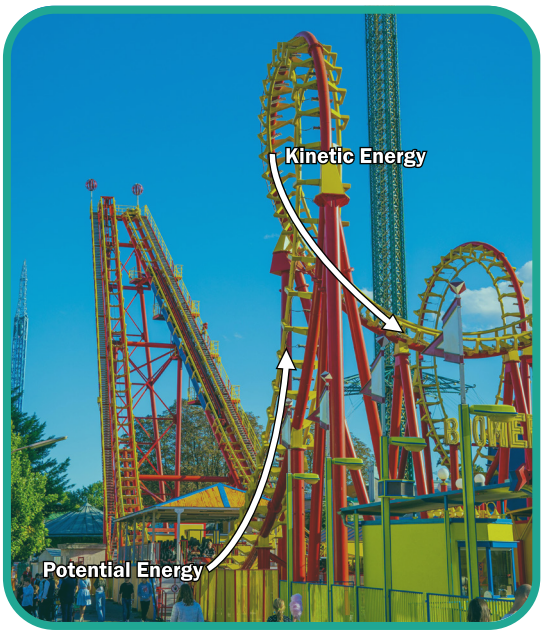
To calculate work, you need to know the force acting on an object and the distance it moves in the direction of the force. Work is given by the formula $W = F \times d \times \cos(\theta)$, where F is the force, d is the distance, and θ is the angle between the force and the direction of motion.

To calculate power, you need to know the amount of work done and the time it took to do it. Power is given by the formula $P = W/t$, where P is power, W is work, and t is time.

BACKGROUND

The concept of work has been around since ancient times, but it was not until the 17th century that scientists began to develop the modern understanding of it as the transfer of energy. This led to the development of the concept of energy and its various forms, such as kinetic and potential energy. The concept of power emerged in the 18th century with the development of steam engines and the need to measure the rate at which work was being done. James Watt, the inventor of the steam engine, developed the unit of power known as the watt, which is still used today. Since then, the concepts of work, energy, and power have become fundamental in physics, engineering, and many other fields, and are essential for understanding and designing physical systems.





Make sure it measures up

APPLICATION

Roller coasters use gravitational potential energy and kinetic energy to create excitement for riders. At the beginning of the ride, the coaster is lifted to a high point, gaining potential energy. When the coaster is released, it begins to descend, converting potential energy into kinetic energy. The speed and intensity of the ride depend on the amount of energy the coaster gains during its initial ascent and how that energy is distributed throughout the ride.

REAL WORLD CONNECTIONS

Wind turbines work by harnessing the kinetic energy of the wind to turn the blades of the turbine, which in turn spin a generator to produce electricity. The amount of power generated by the turbine depends on the speed of the wind and the size of the turbine. The work done by the turbine is the amount of energy transferred from the wind to the generator, which can be calculated using the formula $W = F \times d \times \cos(\theta)$, where F is the force of the wind, d is the distance the blade travels, and θ is the angle between the force and the direction of motion. By measuring the speed of the wind and the size of the turbine, engineers can calculate the amount of power generated by the turbine, which is the rate at which work is being done.

TERMINOLOGY

FORCE: This is a push or pull acting on an object, which can cause it to accelerate or move.

DISTANCE: This is the amount of space an object moves in the direction of the force.

WORK: This is the energy transferred to or from an object by a force acting on it. It is calculated as the product of force and distance, with the cosine of the angle between them taken into account.

ENERGY: This is the ability to do work, which can be stored or transferred between objects.