

AMUSEMENT PARK SCIENCE



CLEVER MACHINERY

PULLEYS
LEVERS
AND MORE

JOHN ALLAN

AMUSEMENT PARK SCIENCE

CLEVER MACHINERY



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Awesome Machines

Machines

A roller coaster travels at amazing speeds, to dizzying heights, with exciting twists and turns. But, a roller coaster is still just a machine.

AMAZING MACHINES


Machines are all around us. We use them every day. Some are simple and some are complex. Wheels, levers and scissors are all simple.

Complex machines include mechanical watches, helicopters, and electric cars.

A simple machine has one of four basic components: wheel, **ramp**, **pulley**, and **lever**. All machines contain at least one of these things.

While most machines are tools that make our lives easier, some machines are built just for fun—like roller coasters.





A loop the loop on a roller coaster. The wheels and track are parts of an exciting machine.

THAT'S AMAZING!

Your muscles and bones form a natural machine—your body! This allows you to move.



Marvelous Machinery

Machines

WHAT IS A MACHINE?

A machine is a device that acts on another object. It might help you push or move something. People use machines to make a task easier. For example, a bicycle lets you move quickly with little effort.

SIMPLE AND COMPLEX MACHINES

A bottle opener is a very simple machine. It has no moving parts. Most machines, though, have many moving parts. The parts of a machine interact with each other to do work.

A complex machine such as a theme park ride often contains a number of smaller, simple machines. For example, an engine may contain many moving parts that act as wheels and levers. These simple machines make the engine run.



The world's first tubular steel roller coaster was The Matterhorn Bobsleds in Disneyland, California, USA. It opened in 1959 and Walt Disney had the idea after a trip he made to the Swiss Alps.





The axle goes through the center of this big wheel. The wheel rotates around the axle and is a simple machine.



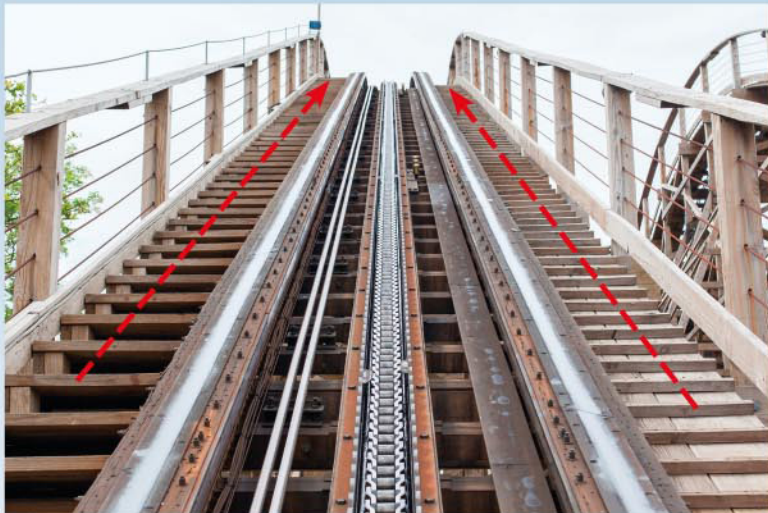
Roller Coasters

Wheels and Ramps

Roller coasters use two basic types of simple machines—wheels and ramps. Wheels make the cars move. Ramps help the cars gain or lose height.

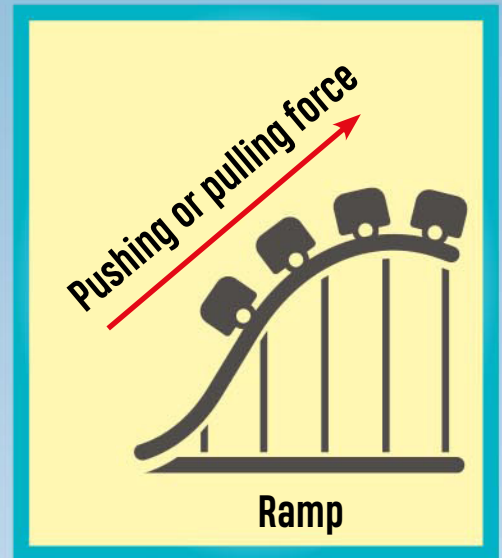
WHAT ARE WHEELS AND RAMPS?

Our everyday lives depend upon the wheel. Without it, we would have no easy way to transport objects or ourselves around. A wheel turning around a fixed **axle** is a simple machine.



A ramp is another simple and useful machine. We use ramps all the time without realizing it.

A ramp is simply a slope, or **inclined plane**. Ramps allow us to raise or lower objects more easily.



ROLLER COASTER MACHINE

With some help from **gravity** and other **forces**, roller coasters deliver a thrilling ride! Gravity pulls all objects toward Earth. The force of gravity also makes objects **accelerate** as they fall to the ground.

Roller coasters are machines made of ramps and wheels.

THAT'S AMAZING!

Roller coasters have a set of wheels that fit below the tracks. These help to keep the car on the tracks, even when it's upside down!

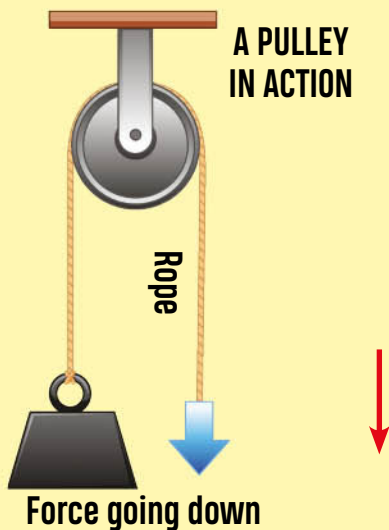
Gravity is about to pull this roller coaster down a slope. Its wheels allow a smooth ride at super-fast speeds.



Up and Down

Pulleys and Levers

Pulleys and levers are two types of simple machines. Pulleys change the direction in which a force pulls. Levers use a **pivot** point to help move an object. A seesaw is a common example of a lever.



A PULLEY
IN ACTION

WHAT IS A PULLEY?

A wheel and rope make up a simple machine called a pulley. The rope loops around the wheel to make it turn. Pulling one end of the rope turns the wheel. This pulls on an object attached to the other end of the rope. Some roller coasters use pulleys to pull the cars up the first hill.

Pulling down on one end of the rope lifts up the weight on the other end of the rope.

THAT'S AMAZING!

X-scream in Las Vegas, USA, is a seesaw ride over the edge of the Stratosphere Tower 1,000 feet above the ground!

AMUSEMENT PARK SCIENCE

CLEVER MACHINERY

Pulleys, Levers, and More

Discover how **THEME PARKS** use science to create **AWESOME**, white-knuckle rides. Hold on to your seat and find out how:

- levers • pulleys • pivots • wheels and ramps
- simple and complex machines
- launch systems and more...

are used to **TAKE YOUR BREATH AWAY.**



Check out all the books in the **AMUSEMENT PARK SCIENCE** series...

- Vertical Drop (gravity in motion)
- Clever Machinery (pulleys, levers, and more)
- Switchback Turns (forces in motion)
- Roller Coaster Ride (acceleration and velocity)