

Things To Remember When You Visit

- For the safety of all please keep hands to yourself.
- Walk, do not run.
- Do not touch objects or exhibit cases unless told otherwise.
- Use indoor voices.
- Stay with the group.
- Follow any extra rules that your Museum Instructor provides.

Vocabulary

Use these words in class discussion, projects, and activities!

- **Work:** Work is the amount of energy necessary to move an object. It is measured by the amount of distance a force moves an object.
- **Simple Machine:** A machine with few or no moving parts that makes work easier. The idea originated with the Greek philosopher Archimedes in the 3rd century BC/BCE!
- **Complex Machine:** Machines that use a combination of two or more simple machines to do a job.
- **Assembly Line:** An arrangement of machines and workers in a factory, where work passes from one to the next until complete.
- **Conveyor Belt:** A moving belt that carries objects from one place to another.

Start Your Engines!

Engineering Autos is an interactive and fun lesson that provides students with an understanding of Henry Ford's innovative use of the assembly line to revolutionize the automotive industry. Students will work in small groups to complete a LEGO® car building challenge.

Activities to Do Before the Field Trip:

Review the six simple machines on the next page and have students come up with classroom examples that they use daily. Chart the findings. Example: Curtain cord: pulley- used twice.



Read the mini biography about Henry Ford and discuss what it would have been like to grow up in the early 1900s. Discuss the types of clothing people would wear, what home life (chores, games, food, etc.) would have been like, and where people went to school. Using the biography and other resources, create a timeline of Henry Ford's life.

Have each student design and build a model car. Using an inclined plane, have the students race the cars and graph the results. Which car can go the farthest? Why?

Show students a picture of a Model T. Compare this car with automobiles we have today. Learn about how people would get from place to place before the invention of the automobile. Discuss the advancement of technology and the constant search for new ideas; how has this changed our lives and what does the future hold? Ask the students what their favorite invention is and why.



Resources Cited- Please see for additional information:

- ✓ http://idahoptv.org/sciencetrek/topics/simple_machines/facts.cfm
- ✓ http://www.racemath.info/forcesandpressure/what_is_f=ma.htm
- ✓ www.usoe.k12.t.us
- ✓ <http://www.hfmgv.org/exhibits/hf>

SIMPLE MACHINES are mechanical devices that do work with one movement. There are six simple machines: the inclined plane, the wedge, the lever, the pulley, the wheel and axle, and the screw.



An **INCLINED PLANE** is a slanted surface used to raise an object. A ramp is an inclined plane. When an object is moved up an inclined plane, less effort is needed than if you were to lift it straight up, but you must move the object over a greater distance.

A **WEDGE** is an inclined plane, or combination of two, that is driven between two objects, or parts of an object to secure or separate them, such as a knife or razor.



A **LEVER** is a bar that can move freely around a fixed position, fulcrum, to help move a fixed load with one end when pressure is applied to the other. Examples of levers are shovels, crowbars, and a seesaw. The bar is the seesaw board and the middle part that elevates the seesaw is the fulcrum.

A **PULLEY** is a chain, belt, or rope wrapped around a wheel. The mechanical advantage of a pulley system is approximately equal to the amount of supporting ropes or strands.



A **WHEEL AND AXLE** is larger wheel that rotates around a smaller wheel or rod (axle) and provides a mechanical advantage. Bicycles, screwdrivers, Ferris wheels, and car gears are all examples of wheels and axles.

A **SCREW** is an inclined plane wrapped around a cylinder to form a spiral, used to join objects together.



Henry Ford: A Brief Biography



Childhood: Born on July 30, 1863, Henry Ford grew up on a family farm in Dearborn, Michigan. He attended a one-room school and was expected to help around the farm by doing chores. In 1879, he left home to work as an apprentice machinist, which he did for three years.

The Engineer: In 1891, Ford became an engineer with the Edison Illuminating Company in Detroit. There, he was able to devote attention to his experiments with internal combustion engines. In

1896, he completed his own self-propelled vehicle, the Quadricycle.

Ford Motor Company: The Ford Motor Company opened in 1903, where groups of two to three men worked on each car with components made to order by other companies. Ford realized his dream of producing an automobile that was reasonably priced, reliable, and efficient with the introduction of the Model T in 1908. This vehicle initiated a new era in personal transportation. It was easy to operate, maintain, and handle on rough roads, making it an immediate success. By 1918, half of all cars in America were Model T's! On May 26, 1927, the last Model T was produced.

Legacy: Henry Ford passed away at the age of 83 in Dearborn, Michigan, on April 7, 1947 leaving a powerful impact on the development of the United States. The assembly line he used in building cars was adapted to produce everything from war materials to hamburgers! The availability of high wage, low skill jobs lead to accelerated immigration, urbanization, an expanded middle class, and eventually the creation of Unions to protect worker's rights. Ford created mobility in a new way that opened the future for more transportation innovations forever altering lives, activities, and landscape.

Fun Facts

The word “automobile” literally means “self-moving.”

At one time, over 2,200 auto manufacturers were in business in the U.S. Over 300 of these companies operated in Massachusetts.

In the early 1900s, automobiles ran on gas, steam, or electricity.

Interdisciplinary connections

Math: Henry Ford paid his workers \$5 per day. The cost of a Model T in 1909 was \$850. How many hours would you have to work at Henry Ford’s factory to pay for a Model T? How many days if you worked 8 hours a day?

Math: In 1919, a Model T could travel for 25 miles on one gallon of gas. How many gallons would you need for a trip from Provincetown to Bourne - a total of 67 miles?

Science: Using the student’s model cars, design experiments to begin learning about Newton’s Three Laws of Motion:

1. A body at rest stays at rest, a body in motion stay in motion, unless acted upon by a force
2. Force= Mass x Acceleration
3. For every force there is an equal and opposite force

Reflecting on your visit:

Be an inventor just like Henry Ford! Have students identify a problem, sketch out an invention, build a model, test their invention, and draw a more detailed blueprint.

Think about the cars you saw during your visit to Heritage Museums & Gardens. Take your previously modeled cars and rethink their design to improve their function. Include new features, like those from the cars you saw on your visit. Think about how it will be fueled. What safety features will it have? How much will it cost? How does the design impact the function? Are you including any new technology that could advance the science of transportation for the future?

After students design their own cars, have them watch or gather current advertisements for automobiles. Find out what ads appeal to students and why. What kind of information is included in the ads? What type of person do students think the ad is targeting? Graph the results. Have students create their own advertisements or commercials for their vehicles.



Resources

Books-

Henry Ford and the Assembly Line, by John Bankston

Henry Ford: Building Cars for Everyone, by Pat McCarthy

Henry Ford and the Model T, by Michael O’Hearn

The People’s Tycoon: Henry Ford and the American Century, by Steven Watts

Eat My Dust! Henry Ford’s First Race, by Monica Kulling

Online-

America on the Move: americanhistory.si.edu/onthemove

The Henry Ford: thehenryford.org/education

Simple Machines: edheads.org/activities/simple-machines/teacher

Exploring Ramps: peepandthebigwideworld.com/resources/pdf/peep-event-ramps.pdf

Simple Science Experiments: <http://www.metrofamilymagazine.com/July-2012/Simple-Science-Experiments-Newtons-First-Law-of-Motion/>