

Extending Your Knowledge Reading Selection

Medieval Warfare in Modern Times

EXTENDING YOUR KNOWLEDGE

READING SELECTION

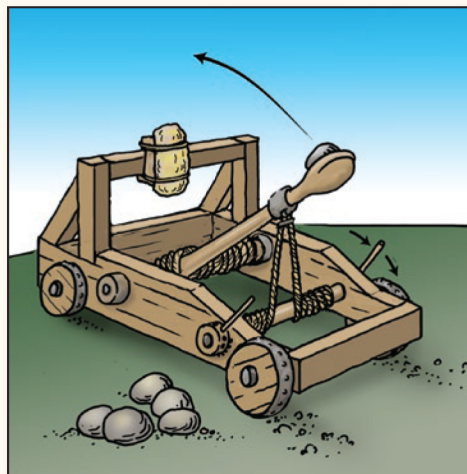
Medieval Warfare in Modern Times

A young man wearing leather armor and carrying a wooden shield runs from the fire of a catapult that is throwing missiles at him. Temporarily out of the catapult's range, he pauses to rest, checks his digital watch, and looks around at the Arizona landscape. Digital watch? Arizona? This man is not a medieval warrior. He is a member of a war reenactment group in the twenty-first century. The catapult is built, as much as possible, like a medieval catapult. However, rather than throwing heavy stones, reenactment catapults throw groups of tennis balls that are taped together. (The word "catapult" comes from two Greek words: kata means "down" and pallein means "to hurl.")

Catapults were war machines during medieval times. They were used to attack castles and fortresses. The catapults hurled large stones and other things at the castle walls or even over the walls of fortresses. Persistent battering could eventually win the battle. Medieval warriors used at least three different kinds of catapults, and the people who participate in medieval battle reenactments today build and use all three of them.

One kind of catapult is the mangonel. The Romans designed it in the third century. It was the most popular kind of catapult of the medieval period. It is also the most popular catapult built for reenactments today. How does a mangonel work?

Setting a mangonel is very much like setting a giant mousetrap. A mangonel has a single arm with a cuplike extension at the end. Two ropes attached to this arm can be wound around a pole using a lever. As the ropes are wound around the pole, the throwing arm is pulled down so that it can be loaded. The more tightly the rope is wound, the greater is the force pulling on the



The mangonel was a popular type of catapult during the medieval period. The throwing arm was used to launch rocks through the air.

throwing arm—the same as when you pull back the bar on a mousetrap. When the throwing arm is released, it snaps forward into a crossbar, which suddenly stops the throwing arm and sends a rock flying out of the cup and through the air. Unfortunately, this is an inefficient kind of catapult because much of the available energy is lost into the framework of the catapult when the throwing arm hits the crossbar. Only a small portion of the energy put into the catapult when the ropes are stretched is converted to energy in moving the stone.

A second type of catapult from medieval times is called a traction trebuchet. With a long pole mounted on a tall frame, this catapult uses the principles of a lever. The pole is positioned so that the fulcrum is close to one end. A sling that holds a rock is attached to the end of the pole

continued

Newton's First and Second Laws

Extending Your Knowledge Reading Selection *Medieval Warfare in Modern Times* *continued*

Discussion Questions

1. Sample Answers

a. medieval: "med" sounds like "medium" or "middle" so this word indicates something in the middle.

b. counterweight: "counter" often means to be in opposition to something so a counterweight is an opposing weight.

c. mangonel: "mangonel" is derived from the Greek *mágganon*, meaning "engine of war."

d. traction: "traction" is the force generated by an object and the surface it rests on.

e. fortress: "fortress" has a similar root to "fortification." It is a protected, or fortified, building.

f. fulcrum: "fulcrum" is a support around which a lever pivots.

2. The article says that the counterweight trebuchet was the most powerful catapult. This is supported by the fact that it was able to throw a 635-kg weight. This appears to be the largest weight described in the article.



PHOTO: Jose Angel Astor Rocha/Shutterstock.com

farthest from the fulcrum. Ropes are attached to the other end of the pole, which is at the end closest to the fulcrum. When a crew of warriors pulls down on these ropes at the end closest to the fulcrum, the long end of the pole rises quickly into the air and sends the rock hurtling toward the target.

In recent years, a crew of five people using a reconstructed traction trebuchet was able to throw a 900-gram (2-pound) lead ball 170 meters (558 feet). Medieval traction trebuchets were known to have crews of 30 men or more.

A much more powerful catapult used in medieval times was the counterweight trebuchet. Like the traction trebuchet, the counterweight trebuchet uses the principles of a lever. However, gravity, rather than a crew of warriors, provides the downward force that sends the rock into the air. A heavy weight is attached to the short end of the

pole. The longer end has to be pulled down by the crew and loaded before it can be used. When the long end of the pole is released, gravity pulls the heavy weight on the short end down. The long end is raised into the air, and the stone is sent flying. This design worked well; 44 such catapults spread havoc around Europe during medieval times. A modern counterweight trebuchet with a 5,400-kilogram (11,905-pound) weight has been used to throw a 635-kilogram (1,400-pound) car 79 meters (259 feet) and 45 kilograms (99 pounds) of iron 215 meters (705 feet).

While catapults like these and others from medieval times are no longer used in war, they are still of great interest to a number of people. War-reenactment groups, historians, and others build them. Over the years, all sorts of items have been launched with catapults—from stones and spears to people, pianos, and pumpkins. ■

Newton's First and Second Laws

Homework

Period 1

Have students prepare additional force diagrams for everyday situations, for example: a suspension bridge, a comet, and a branch in a stream.

Period 2

Ask students to demonstrate Newton's second law by having a friend push an empty box across the floor. Then, have them fill the box with several heavy books

and have the friend push the box again. Students should explain to the friend why more force was needed to push the heavier box by drawing diagrams of the forces involved. Students should also explain how the net force on the box is related to its mass and acceleration.

Period 3

Have students read Extending Your Knowledge: *Medieval Warfare in Modern Times* and begin thinking about what materials would be required to build a catapult.

Period 4

Have students visit ssec.si.edu/stc3 to explore Smithsonian resources about forces and frames of reference. Next, have students share their findings with an adult.

Extension Activities

Extension activities for this lesson are available at ssec.si.edu/stc3



PHOTO: Gabriele Maltini/Shutterstock.com

Types of trebuchets include traction (left) and counterweight (right). What similarities and differences do you see?

Discussion Questions

1. Use your knowledge of word roots, prefixes, and suffixes or use reference sources to explain the meaning and origins of the following words from the article:
 - a. medieval
 - b. counterweight
 - c. mangonel
 - d. traction
 - e. fortress
 - f. fulcrum
2. Which of the catapults described is most effective? Use evidence from the article to support your opinion.

