

13. Medieval Geer Quest

Classroom Activity: Design and build a machine that can accurately fire a marble-sized ball of modelling clay from a predetermined distance into a pre-built castle. Working in groups, students are given a budget of 1,500 project dollars that they can use to purchase supplies and building materials.

Grade(s): 5 and 7

Strand(s): Understanding Structures and Mechanisms (Grades 5 and 7)

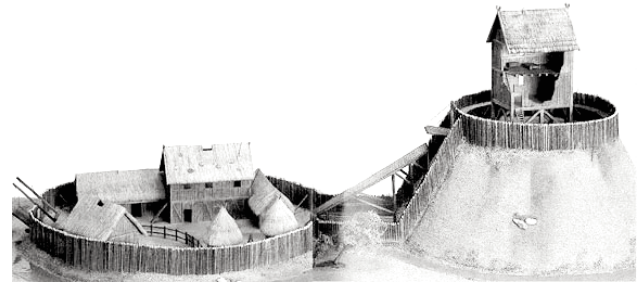
This task addresses the following grade 5 overall expectations:

- investigate forces that act on structures and mechanisms;
- identify forces that act on and within structures and mechanisms, and describe the effects of these forces on structures and mechanisms.

and the following grade 5 specific expectations:

- follow established safety procedures for working with tools and materials;
- use scientific inquiry/research to investigate how structures are built to withstand forces;
- use technological problem-solving skills to design, build, and test a frame structure that will withstand the application of an external force or a mechanical system that performs a specific function;
- use appropriate science and technology vocabulary, including tension, compression, torque, system, and load, in oral and written communication;
- use a variety of forms (e.g., oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes;
- identify internal forces acting on a structure, and describe their effects on the structure;
- identify external forces acting on a structure and describe their effects on the structure, using diagrams.

This task addresses the following grade 7 overall expectations:



- design and construct a variety of structures, and investigate the relationship between the design and function of these structures and the forces that act on them;
- demonstrate an understanding of the relationship between structural forms and the forces that act on and within them.

and the following grade 7 specific expectations:

- follow established safety procedures for using tools and handling materials;
- design, construct, and use physical models to investigate the effects of various forces on structures;
- investigate the factors that determine the ability of a structure to support a load;
- use technological problem-solving skills to determine the most efficient way for a structure to support a given load;
- use appropriate science and technology vocabulary, including truss, beam, ergonomics, shear, and torsion, in oral and written communication;
- use a variety of forms (e.g., oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes;
- describe ways in which the centre of gravity of a structure affects the structure's stability;
- identify the magnitude, direction, point of application, and plane of application of the forces applied to a structure;
- distinguish between external forces and internal forces (tension, compression, shear, and torsion)

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acting on a structure;

- identify and describe factors that can cause a structure to fail.

Assessment Categories:

- Thinking and Investigation
- Communication

Cross-discipline connections: Social Studies/History

Type of Activity: Classroom/extracurricular

Preparation: (approx. 370 minutes)

(Note: This activity was part of year-end project/party where students dressed in medieval period costumes and enjoyed an "eat with your hands lunch". The time includes party preparations.)

Construct a medieval castle or obtain a toy one to use as a target for the student-built catapult machines. Modeling clay to make the catapult balls.

Time needed to complete the task: approx. 3 hours

Materials and Resources for Teachers:

Yes Camps National Project Book 1996

Materials and Resources for Students:

paper

pencils

styrofoam (15 x 20) \$1,000

cardboard (15 x20) \$500

elastic bands (\$100/each)

egg cartons (\$50/each)

string (arm span - \$50)

masking tap (arm span - \$250)

duct tape (arm span - \$250)

plastic bags (\$20/each)

popsicle sticks (\$20/each)

pins (\$10/each)

drinking straws (\$10/each)

"purchase orders"

Activity Description:

Explain the challenge to the whole class.

Divide the students into groups of 3 or 4 and give them approximately 45 minutes to brainstorm and purchase their supplies. Allow between 45 and 75 minutes for the groups to construct their catapult machines and test them. Once tested, the competition begins. Each group is allowed three attempts. Landing in the castle is worth 100 points, hitting the outside of the castle is worth 50 points. The points of all three tries are added. Bonus points are awarded for cost effectiveness: 50 for the least expensive machine, 40 the next, etc. Only machines that scored hits are eligible for bonus points.