



**Grade / Age:** Secondary School Students (Grades 9-12 / Ages 14-18)

**Topic:** Castle of 5-Liters

**Subject area:** Mathematics, Sciences, Arts

**Keywords:** Volume, Geometry, Engineering, Creativity, Problem-solving, Spatial Reasoning, STEAM

**Single/team work:** Team Work

**Language:** English (can be adapted to other languages)

**Duration:** 4-5 weeks

**Description of the Task:**

**The 5-Liter Design Challenge: A STEAM Adventure**

Students will work in interdisciplinary teams to design and construct a castle with a volume of exactly 5 liters. The project will include the following stages:

**Conceptualization Phase:** Teams will choose various geometric shapes (e.g., pyramids, cubes, spheres) for their castle and calculate their volume to meet the 5-liter requirement.

**Design Phase:** Students will sketch their castle design, incorporating artistic elements and considering material choices.

**Construction Phase:** Teams will construct their castle using chosen materials, applying engineering principles and ensuring the volume is exactly 5 liters.

**Testing Phase:** Teams will measure the volume of their constructed castle to verify it meets the 5-liter requirement.

**Presentation Phase:** Teams will present their castle, explaining the mathematical calculations, engineering principles, and artistic elements involved.

**Objective:** To challenge students to construct a castle with a volume of exactly 5 liters, applying mathematical and engineering principles. Reinforce understanding of volume calculation, geometric properties, creativity, problem-solving, and spatial reasoning.

**Methodology:** Students will choose a geometric shape (e.g., sphere, pyramid) for their castle and calculate its volume to meet the 5-liter requirement. They will then proceed to design and construct their castle, experimenting with different materials and designs.

**Tools Used:** Measuring tools (ruler, measuring tape), calculators, construction materials (cardboard, plastic, foam), design software (optional).

**Learning Outcomes:** Enhanced understanding of mathematical concepts like volume and geometry, improved problem-solving and spatial reasoning skills, fostered creativity through design, and hands-on experience with engineering principles.

**Impact on STEAM Education** The project offers a practical, fun, and engaging way to apply mathematical knowledge in a STEAM context. It fosters a deeper understanding and appreciation of mathematics, while also integrating engineering principles and creative design, making it a comprehensive and impactful educational experience.

**Solutions of the Task:** The solution will vary depending on the chosen geometric shape and design. Students will be assessed on their mathematical calculations, engineering skills, creativity, and presentation.

**Prior knowledge:** Understanding of volume calculations, basic geometric properties, and introductory engineering principles.

**Comments:** This project fosters creativity, critical thinking, problem-solving, and collaboration. It integrates mathematics, sciences, and arts through a hands-on, practical approach. Teachers may need to provide training or resources on volume calculations and basic engineering principles.

**Connection to other subjects/topics/areas:**

Mathematics: Volume calculations, geometric properties, spatial reasoning.

Sciences: Engineering principles, material science.

Arts: Creative design, aesthetic considerations.

Technology: Use of design software (optional), technological innovation.

Language Arts: Research, presentation skills, written reflection.

This activity provides a rich, interdisciplinary experience that engages students in a meaningful, real-world project, allowing them to explore the connections between volume, geometry, engineering, and STEAM education. It encourages students to think creatively and work collaboratively, fostering a holistic approach to learning.