

## Core Skills Analysis

### Physics

- Understood the principles of tension and compression through the construction of the ballista frame and arms.
- Learned about projectile motion by observing how the projectile travels through the air after being launched.
- Gained insights into kinetic and potential energy as they loaded the ballista with varying weights, noting how distance changed.
- Recognized the role of force and angles in determining the trajectory and distance travelled by the projectile.

### Mathematics

- Applied basic geometry concepts to measure and cut wood for accurate ballista construction.
- Utilized addition and multiplication to estimate the total length of materials required for building the ballista.
- Engaged in problem-solving when calculating the optimal angle for launching the projectile.
- Practiced measuring distances and angles using tools, reinforcing their understanding of units and conversions.

### Engineering

- Developed critical thinking and planning skills by designing a working model of a ballista.
- Learned about different material properties and their suitability for construction through trial and error.
- Honed skills in assembly and disassembly, focusing on how each component functions within the overall mechanism.
- Explored the importance of safety measures while constructing and testing the ballista, like understanding the force at impact.

### Tips

To further enhance their understanding, the student could explore the history of ballistae and how they were used in ancient warfare, as well as different types of siege engines. They could also experiment with projects that involve modifying the ballista to see how changes in design affect performance. Encouraging improvements in their building skills and trying out different materials can lead to more efficient ballista designs and further insights into material science.

### Book Recommendations

- [The Big Book of Building](#) by The Editors of Klutz: A hands-on guide that teaches kids basic construction techniques through fun building projects, including catapults and other siege technology.
- [Engineers in the Field](#) by Sandy Harper: A groundbreaking book exploring different engineering projects and principles, making complex concepts accessible to young readers.
- [The Science of Flight: A Historical Perspective](#) by Mark Denny: This engaging book dives into the science behind projectiles, flight, and engineering, providing a history to support practical experiments.