

Core Skills Analysis

Physics

- Karina learned about basic principles of physics such as gravity and inertia through designing slopes and curves for the marble's movement.
- She experimented with potential and kinetic energy by adjusting the height and angles of the paper rollercoaster tracks to control the marble's speed.
- The activity enhanced her understanding of cause and effect by seeing how changes in the rollercoaster's design impacted the marble's path and velocity.
- Karina developed spatial reasoning skills by visualizing and constructing a three-dimensional track that allowed the marble to successfully complete its journey.

Engineering and Design

- Karina practiced problem-solving while creating a stable structure capable of supporting the marble's weight.
- She explored the engineering design process, including planning, building, testing, and refining her rollercoaster model.
- Her work required fine motor skills coordination to manipulate paper and assemble components with precision.
- Through trial and error, Karina learned the importance of iteration to improve the functionality of her design.

Mathematics

- Karina applied measurement skills to cut and shape paper pieces with accuracy.
- She intuitively engaged with angles and geometric shapes to create tracks that guide the marble efficiently.
- Karina observed patterns in the marble's motion that relate to velocity and acceleration concepts.
- The project reinforced counting and sequencing as she tracked different sections and order of assembly.

Tips

To extend learning from the paper marble rollercoaster, encourage Karina to experiment with varying track heights and materials to see how friction affects motion. Integrate simple graphing by having her record time trials for the marble to complete the track and plot results to observe patterns. Introduce basic engineering concepts by discussing real rollercoasters and safety features, then challenge her to redesign the track for speed or length. Lastly, involve storytelling by having her create a narrative around the rollercoaster ride, linking creativity with science and engineering.

Book Recommendations

- [Roller Coaster](#) by Marion Turner: An engaging introduction to the physics behind roller coasters, perfect for young readers curious about how rides work.
- [Engineering for Kids: Simple Machines](#) by Sheri Amsel: A hands-on guide that introduces children to engineering through fun projects, including concepts related to motion and structures.
- [The Way Things Work Now](#) by David Macaulay: A detailed and beautifully illustrated book explaining machinery and physics principles in an accessible way for children.

Learning Standards

- CCSS.ELA-LITERACY.RI.3.3 - Describe the relationship between a series of historical events, scientific ideas or concepts.
- NGSS 3-PS2-2 - Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.
- CCSS.MATH.CONTENT.3.MD.A.1 - Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.
- NGSS ETS1-2 - Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

Try This Next

- Design a worksheet for Karina to sketch different track layouts and predict the marble's path before testing.
- Create a time trial quiz where she records marble run times and answers questions about speed, height, and momentum.
- Encourage her to write a brief story about a marble's adventure on the rollercoaster to combine narrative skills with science.

Growth Beyond Academics

Karina likely developed perseverance and patience as she refined her rollercoaster design through trial and error. The project fosters creativity and independent problem solving, helping build confidence in experimenting with hands-on activities.