Marble Genius

Racing Set

Mid-Valley
STEM-CTE HUB

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Marble Genius Racing Set

The Marble Genius Racing Set STEAM Kit invites students to explore physics, engineering, and creative problem-solving through marble run design and competition. With two full racing sets, students work in teams to construct intricate tracks that emphasize speed, momentum, and structural stability. This kit supports inquiry-based learning, testing concepts like gravity, angles, and energy transfer while encouraging iteration, collaboration, and fun marble-to-marble races.

Grade Level

2^{nd} - 8^{th}

Group Size

up to 10 students

Time Duration

30 - 60 minutes per activity

Content of Kits

Components

- 2 sets of Marble Genius Racing Set

Usage

Getting Started

1. **Introduce the Challenge and Concepts -** Start with a quick discussion about gravity, friction, momentum, and angles. Demonstrate how a marble travels through a short, simple track.

2. **Review the Kit Components -** Show students the types of pieces (chutes, tubes, curves, splitters, and bases) and explain how to snap them together securely.

3. **Assign Team Roles -** Divide responsibilities into roles like "Designer," "Builder," "Tester," and "Recorder" to encourage collaboration and organization.

4. **Start with a Simple Build -** Have each team build a basic marble run using fewer pieces, then test and observe how the marble behaves before moving on to more complex designs.

5. **Establish a Track Test Zone -** Set up a clear area for marble testing—ideally on a flat, hard surface with space for competition and observation.

Storage

- Please disassemble and return all parts to the storage bin provided in between uses.

Troubleshooting

- **Track Keeps Falling Over -** Make sure bases are evenly distributed and that heavier pieces are placed lower to improve stability.
- **Marble Stops Midway -** Check for gaps between pieces, steep drops, or loose connectors. Adjust angles and smooth transitions.
- **Marbles Launch Off the Track -** Reduce steep angles or sharp turns. Add barriers (like tape guides) to help guide the marble along the path.
- **Pieces Not Fitting Snugly -** Double-check alignment before snapping parts together—twist gently if needed. Avoid forcing pieces.
- **Racing Paths Are Uneven -** Encourage teams to redesign for symmetry or test how different elements affect speed and timing.

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Activity Guide

Beginner

Speed Test Track
Students build a simple, straight marble track and measure how long it takes for the marble to travel from top to bottom. They then test how changing the angle or height of the starting point affects speed, helping them observe how gravity and slope impact motion.

Intermediate

Loop & Drop Design Challenge
Teams design marble runs that must include at least one loop and one drop. They test how well the marble moves through the course and adjust features to improve flow, stability, and completion success, reinforcing experimentation and design iteration.

Advanced

Race Track Tournament
Teams use both sets to build symmetrical side-by-side tracks for a marble race. They test multiple runs, analyze results, and refine their designs for maximum speed and consistency. A class leaderboard tracks fastest times, encouraging precision and creativity.

Extension Activities:

Marble Run Maze
Students design a marble run that requires the marble to pass through specific zones or checkpoints without falling off the track. They use strategic planning, collaborative testing, and creative problem-solving to build a path that prioritizes control over speed.

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Learning Extensions

STEAM Connections: Engineering - Physics - Math

Learning Objectives:

- Understand how gravity, friction, and momentum affect object motion in a track-based system.
- Apply engineering design principles through building, testing, and refining marble runs.
- Strengthen observation and data collection skills by timing races and recording results.
- Collaborate with peers to problem-solve, share ideas, and troubleshoot design flaws.
- Communicate findings through team discussions and presentations of design choices.

Career Connections:

- **Mechanical Engineer –** Designs and tests systems that rely on motion, force, and mechanical components.
- **Architect –** Uses spatial reasoning and structural planning to create stable, functional designs.
- **Theme Park Ride Designer –** Builds high-speed, track-based experiences using principles of physics and motion.
- **STEM Educator or Program Facilitator –** Leads interactive, hands-on challenges to reinforce STEAM learning.
- **Toy/Product Designer –** Creates safe, engaging systems that combine design with scientific principles.

Essential Employability Skills:

- Mechanical Engineer
- Architect
- Theme Park Ride Designer
- STEM Program Facilitator
- Toy/Product Designer

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Resources and Accessibility

Safety Guidelines

- **Supervise Marble Use –** Marbles are small and can pose a choking hazard; always monitor use and keep away from the mouths of younger students.
- **Build on Stable Surfaces –** Ensure marble runs are built on flat, solid surfaces to prevent tipping or collapsing structures.
- **Clean Up Spilled Marbles Immediately –** Prevent slipping hazards by promptly gathering any marbles that roll off the work surface.
- **Avoid Forceful Assembly –** Encourage students to handle pieces gently and follow connection guidelines to avoid snapping or cracking parts.
- **Keep Workspace Clear –** Remind students to keep their areas organized to prevent crowded builds or lost pieces.

Accessibility

- **Provide Pre-Sorted or Color-Coded Pieces –** Organize pieces by shape or color to assist with visual processing or reduce search time.
- **Use Visual Aids or Step Guides –** Offer build diagrams, photo sequences, or simplified instructions for students who benefit from visual scaffolding.
- **Allow Seated or Table-Height Builds –** Ensure students with mobility needs can access materials comfortably without needing to stand.
- **Offer Role Flexibility –** Let students participate as designers, testers, timekeepers, or observers based on their strengths and comfort levels.

Library Catalog

Library Resources

Feedback

QR to feedback survey