



Marble Rush™ Raceway Set Gravity Challenge

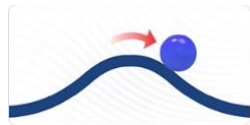
This Marble Rush™ challenge explores the concept of gravity. This concept can be observed or demonstrated by constructing and playing with the marble track set. The Yellow 360° Loop, Green Ski Jump, and Yellow Peg Maze are fun ways to explore the force of gravity.



Marble Rush™ Golden Rules of Physics



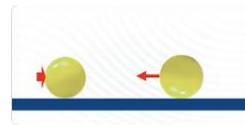
Rule #1: Gravity
Gravity pulls things down.



Rule #2: Slope
Slope affects speed.



Rule #3: Random
Random is unpredictable.



Rule #4: Force
Force is a push or a pull.



Rule #5: Friction
Friction is everywhere.

Learn About Gravity

Gravity is a word for a force that pulls all objects toward each other. On Earth, the force of gravity is always present and is most noticeable when objects fall to the ground because of the gravity's pull. Gravity is what pulls the marbles from the top of the track set helping them to roll down to the bottom and pick up speed and momentum. As the marbles reach the bottom, they continue to roll until they are stopped by an object or loses all that moment due to friction.

Real World Connection

Gravity is an invisible force that constantly pulls objects towards each other, and it impacts nearly everything we do. The force of gravity is roughly the same for every object on Earth, whether they are moving or if they are completely still. Gravity is important for learning about physics because it is a key pulling force that gives objects motion simply by pulling them from a high place down to a lower place. We can see this when kids climb to the top of a slide and gravity pulls them down the sloped slide or when a pencil rolls off a table and gravity pulls it down to the floor. In this challenge, school-aged scientists will investigate gravity's influence on marbles at different starting heights and the forces required to move marbles back up, overcoming the pull of gravity.

Hands-On Challenge: Gravity!

What's Needed:

- Marble Rush™ Raceway Set
- 4 marbles
- Marking tape
- Something to write with (pencil, pen, crayon, marker)



Complete the construction set as illustrated, then place 4 marbles in the Starting Gate to begin.



Press the flag to start the marbles down the track. Note how they all roll down. Pay special attention to where they stop.



Press down on the Orange Launcher to shoot the marble **up the track**. Discuss possible reasons for why the marble can roll up the track when the force of gravity is pulling it down.

Thinking Critically: Gravity Games

Exploration 1: Gravity at New Heights

Explore how the effect of gravity on the marble can change depending on the height of the track. First, remove the Orange Curved Track and the Orange Launcher at the end of the original track design so the ball will just roll off the track onto the floor. Next, start 1 marble at the top and watch it go down. Now, when the marble goes through the track it should roll off the track and onto the floor. Place a piece of the marking tape on the floor to show where the marble stopped rolling. Repeat this test a total of 5 times and mark the results on the tape.

- Did all the marbles roll the exact same distance? Why do you think this is?

Now, make the tower taller or shorter to record 5 more runs and note the results to see how they compare to your first design.

- Which design resulted in marble to rolling farthest?



Exploration 2: Up is the New Down

Now that you've seen how gravity pulls the marbles down, explore how the marbles can go up the tracks (even if for just a moment) against the pull of gravity. Use different track pieces to design a track that allows the marbles to roll up the track easier than the original construction design.

- Did you ever see the marble going up the track in the original construction design? If so, which pieces did this happen with?
- Is there a way to get the marble to go higher than from where it started? Why or why not?

