



Traveling Science Workshops

Force & Motion: Transfer of Energy

You have a lot of experience with making things move, but have you ever stopped to really consider what it is that makes something move? Grab a ball and play around with it for a few minutes noticing all the different ways you can make it move and then dig in to the next three activities for a little more advanced experimenting! Please, share your experiences with us to the email address below—we'd love to know what you discover!

What Happens When Balls Collide?

Supplies

- 2 to 5 marbles or other small balls
- 2 yardsticks, strips of wood, or dowels
- masking tape

What to do

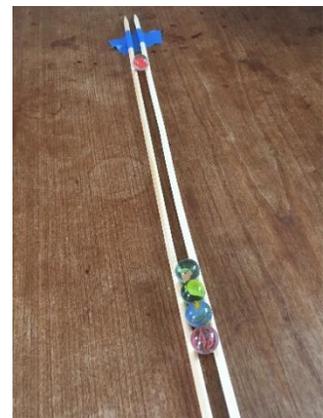
- Lay two yardsticks on a table or the floor parallel to one another with a quarter inch gap between them to create a track for your balls (increase the gap size if you are using larger balls).
- Place one marble on the gap at the midway point of the two yardsticks and one marble on the gap at the end of the yardsticks.
- Set the marble at the end of the yardsticks in motion so that it rolls along the gap in the yardstick and collides with the marble in the middle.
- Try varying the force and speed of the marble you set rolling.

What do you notice?

- Now place two marbles in the middle of the track and roll a third marble in from the end.
What happens when the one marble collides with the other two?
- Try varying the force applied to the marbles and the number and order of marbles. You might also try rolling two marbles from opposite ends of the yardstick at the same time and note what happens when they collide in the middle.

What's going on?

In order to make an object move, a force must act upon it. When a moving object collides with another object it transfers energy to that object. The faster the object is moving, the greater the impact.





Ninja Balls: Making a Super Bouncer

This activity is best done outside or in a large room with a lot of space where nothing can be broken if hit by a ball in motion.

In the last experience you may have noticed that the motion energy from one ball could be used to make another ball move. In this activity, you can explore that concept when two balls are dropped together.



Supplies

- One large ball such as a basketball
- One smaller, lightweight ball such as a tennis ball

What to do

- Bounce the larger of the two balls and note how high the ball bounces.
- Do the same with the smaller ball.
- Now stack the small ball on top of the larger ball and drop the two balls together at the same time.

What do you notice?

What do you think might be making the small ball bounce so high when the two balls are dropped together as one?

What's going on?

The energy from the larger bouncing ball is transferred to the smaller ball when the two balls drop and hit the ground together. This makes the smaller ball bounce higher than either of the two balls dropped individually.

Balls on the Move!

Supplies

- Marble or other small ball
- pair of scissors
- roll of masking tape or other tape
- toilet paper or paper towel tubes (or roll your own tubes out of paper)
- 'tracks' made from 2" x 6" strips of stiff paper folded in half the long way*
- a kitchen chair or a large cardboard box to serve as a base to which you can secure your tubes and ramps with tape

*You can vary the length of your tracks. Experiment with mixing shorter and longer tracks!



What to do

Create a path of tubes and ramps for a marble to travel along from the top of your chair or box to the bottom.

- Choose a location at the top to be your starting point and a point at the bottom to be the endpoint.
- Using masking tape, position and secure the tubes and tracks in place between your start and endpoints, so that a marble released at the top of the box or chair will travel around the chair, possibly back and forth, eventually reaching the bottom endpoint. The path is up to you!
- To test the path the marble takes, secure your tubes and tracks one at a time, releasing the marble at the top each time you position a new track piece. Adjust your tubes and tracks as needed to ensure a continuous ride from start to finish.



Remember: Part of the design and engineering process involves tweaking and adjusting your original plan. Perseverance is key to success. When you fail the first, second, and third time, keep on trying!



If you succeed with one track design, challenge yourself to create another path. Maybe you might try adding a little uphill section too! See where your imagination and force and motion take you.

Share your discoveries with us!

We want to know about your force and motion explorations. Share your experience with us in any of the following ways:

- Draw a picture
- Take photos of your game
- Write down what happened, what surprised you, what didn't surprise you, or anything else that was fun or interesting about your experiences.

Then email us at myhomediscoveries@discoveryacton.org, we can't wait to hear from you!

Resources

- When Objects Collide <https://www.youtube.com/watch?v=mFQ7jy4dJP4>
- Ninja Balls <https://www.scienceworld.ca/resource/energy-transfer-through-balls/>
- NASA STI Program, Toys in Space, 2 <https://www.youtube.com/watch?v=E9RDlIjgftI>
- Top 6 kinetic art objects by MIT scientist and artist, Arthur Ganson <https://www.youtube.com/watch?v=R-d7l48-95A>