

China to Chicago: Newton goes global!

The laws that govern the motion of a pitched baseball or elevated train in Chicago, Illinois, are the same as those that govern a flying soccer ball or magnetic levitation train in Shanghai, China. Although global politics change with the wind, and fashion, music, and food are as varied as the people who enjoy them, the laws of physics never change. This is reassuring in a way—it may be that physics is the universal language.

The purpose of this activity is to learn about another person, halfway around the world, in a place that might be foreign to you. Yet even though you live in distant places, your lives are likely similar. Teachers, friends, college searches, and even Facebook give you common ground. Although being a teenager has some universal truths, you are also quite different. You learned different languages as children; holidays shared by your families are poles apart; even your appearances may be different. It is from these differences that much can be learned, shared, and enjoyed—together. Our hope is that sharing can take place and the experience will leave your understanding of the world, and the physics that govern it, a little better off.

Getting to know you

Here are some talking points to use as you get to know your lab partner on the first day:

- name
- family
- interests
- favorite things (food, music, and so on)
- goals
- future plans

Once you have covered these topics, ask each other the following:

- What do you enjoy about your country?
- What would you change about your country?
- What are the differences between our two countries?
- What are some of the stereotypes of people from my country?

The goal of this lab is to develop a relationship and be able to “introduce” your partner the next day in class!

Know your physics

Now, put your brains together—even though they are over 11,000 km apart—to solve these:

- If the acceleration of a car is zero, are no forces acting on it?
- Only one force acts on an object. Can the object have zero acceleration? Can it have zero velocity?
- The force of gravity on a 2 kg rock is twice as great as that on a 1 kg rock. Why doesn't the heavier rock fall faster?

- When you stand still on the ground, how large a force does the ground exert on you? Why doesn't this force make you rise up into the air?
- When you jump up in the air, the Earth pulls you down. What is the reaction force? Does this force cause the Earth to move?
- When a car is hit from behind, the driver's head appears to snap backward, causing whiplash. Does the head actually go backward?

Calculator time

Use your calculators to solve the following:

A 156 kg baseball traveling 37 m/s strikes a catcher's mitt, which, in bringing the ball to a stop, recoils backward 11 cm. What is the average force applied by the ball on the glove?

A 12 kg bucket is raised vertically by a rope, in which there is 163 N of tension at a given instant. What is the acceleration of the bucket? Is it up or down?

A 15 kg box is released on a 32° incline and accelerates down the incline at 0.3 m/s^2 . Find the friction force impeding its motion. What is the coefficient of kinetic friction?