Forces among Us

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TEXAS EDUCATION AGENCY

Forces among Us

region 4 Educated Solutions

TEA Texas Education Agency

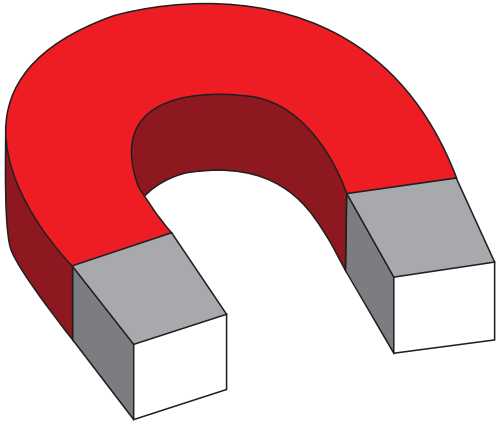
This book was developed in collaboration with Region 4 Education Service Center, Houston, Texas.

Force

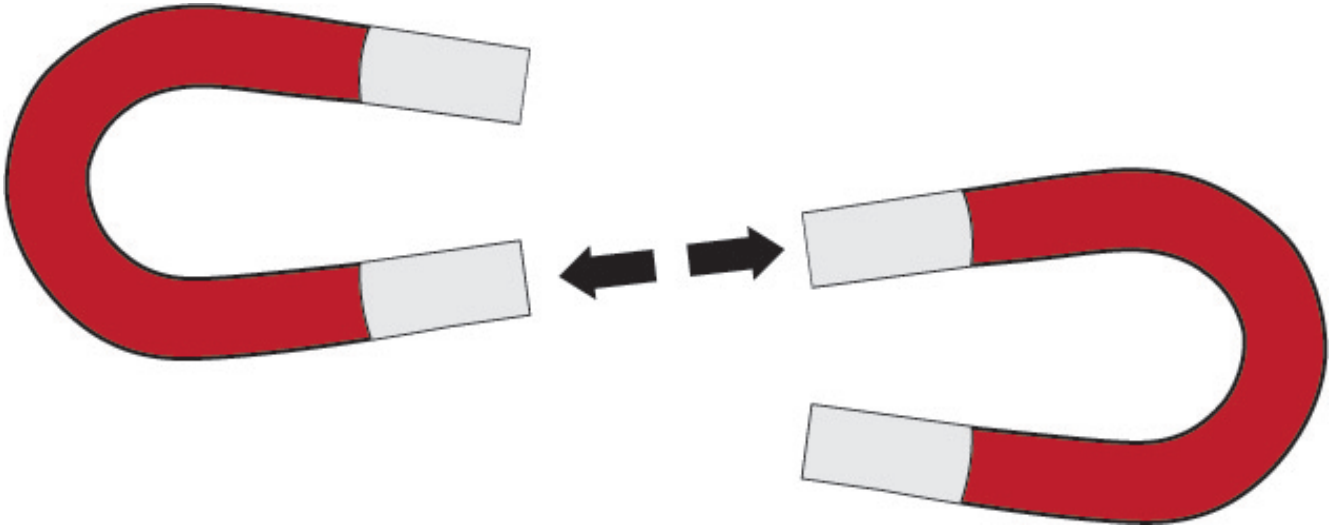
A force is a push or a pull. You use force every time you move something. For example, writing your name involves moving your pencil. You need force to make that happen. Magnetism, gravity, and friction also are forces.

Magnetism

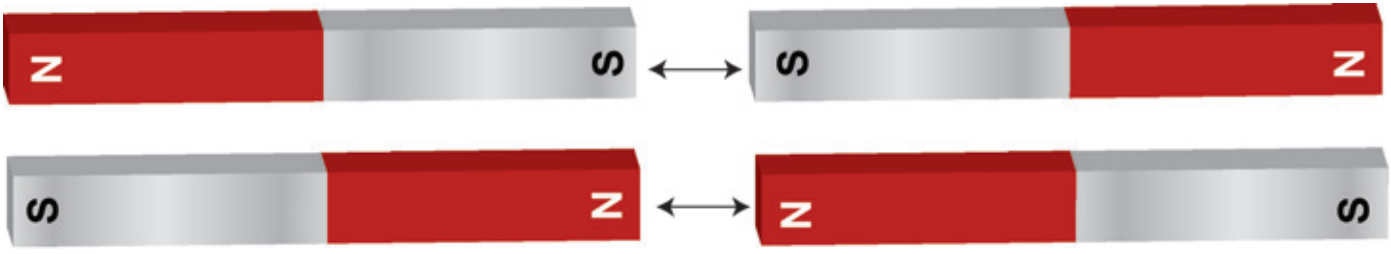
Magnets have pushing and pulling forces because they have north and south poles.



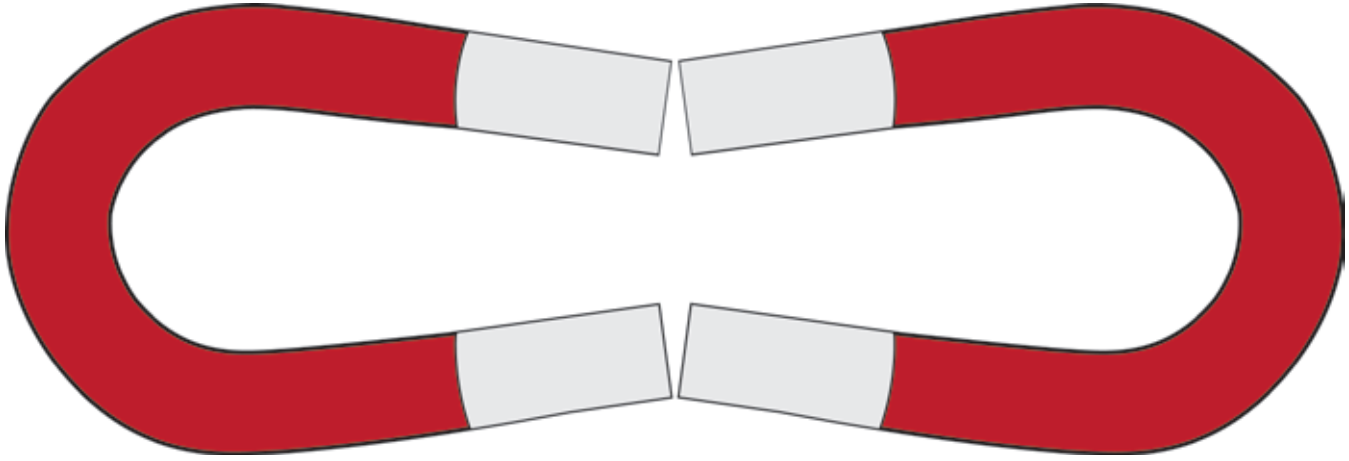
What causes magnets to repel?



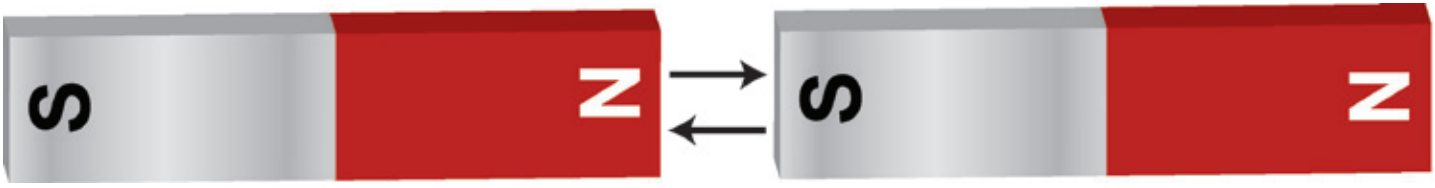
Magnets will flip over, spin around, and chase each other when you put like poles together.



What causes magnets to attract?



Opposite poles attract, or pull toward, each other.



Are some magnets stronger than others? Does the size of a magnet affect its strength? Are some objects attracted to magnets while others are not?

Gravity

Have you ever tried to jump and stay in the air without touching anything?

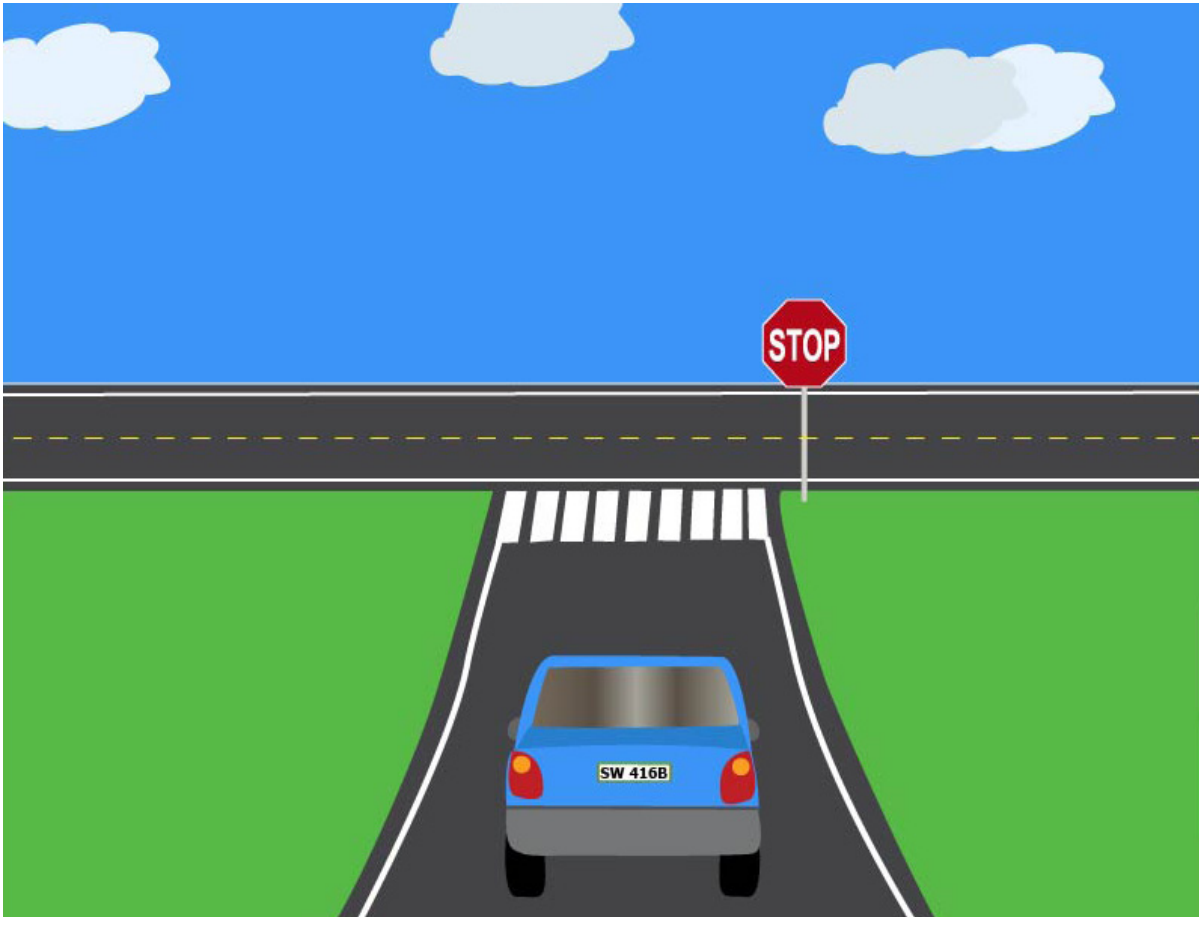
Is it even possible?

Why does everything fall toward Earth? Earth has a huge mass, which means it has a huge gravitational pull.

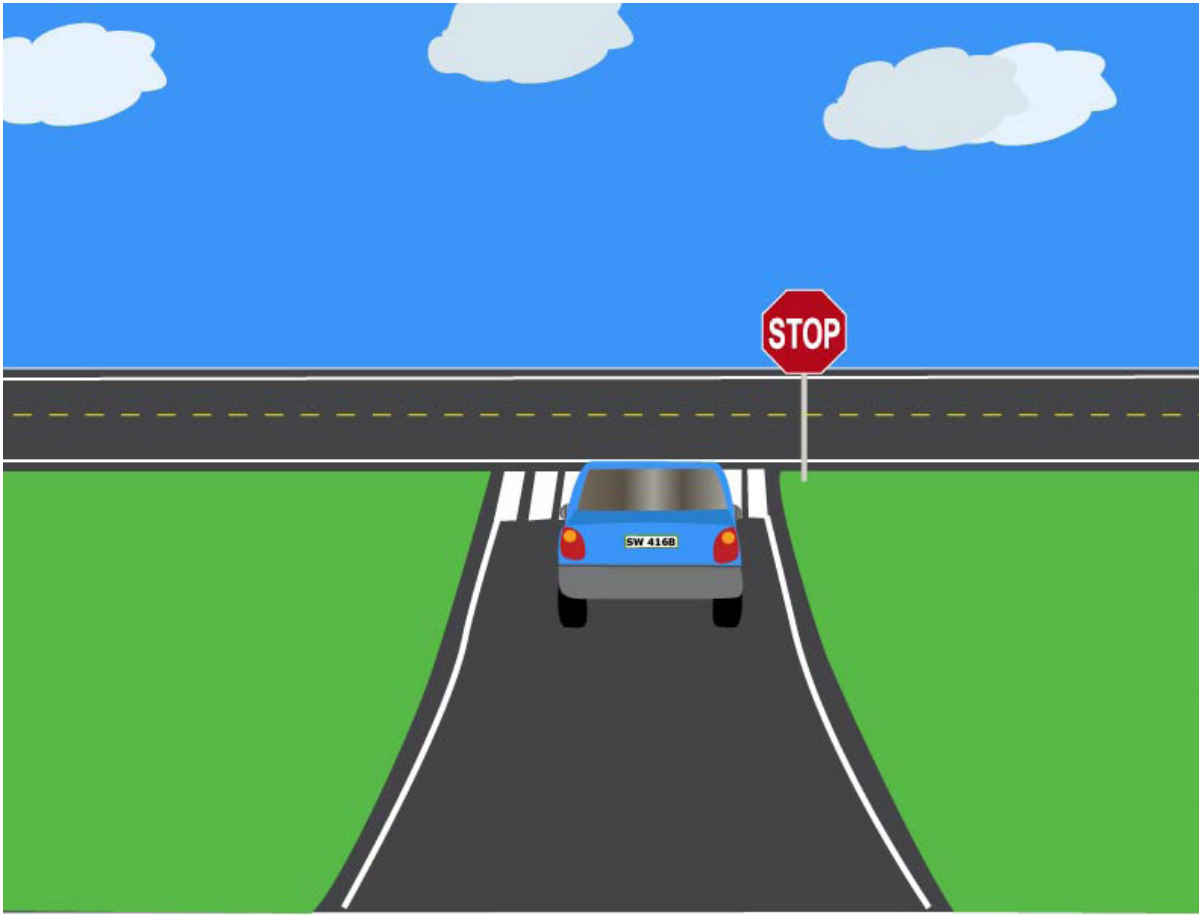
The larger an object's mass, the stronger its gravitational pull.

Friction

Have you ever been riding in a car that needed to stop? What did the driver do?



The driver pushed on the brake pedal. The friction between the tires and the brakes caused the car to stop.



Have you ever kicked a ball only to observe that it eventually stops rolling? Why does that happen?

Friction is a pushing force that occurs when two objects rub against each other. The ball stopped rolling because the friction between the ball and the grass caused it to slow down.

Why do you think this skier waxes her skis?

The skier waxes the bottom of her skis to reduce friction between the snow and her skis. This allows the skier to go faster.

Why do you think this surfer waxes his surfboard? You might think he wants to reduce friction, but no!

The surfer uses a different kind of wax on the top of his surfboard to increase friction between the board and his body. The wax keeps him from slipping off into the water.

Spring Scales

How do scientists measure the amount of force used on objects? Scientists use tools called spring scales. Spring scales show us how much force is pushing or pulling on an object. We measure force in metric units called newtons (N).

Hold a spring scale by the ring to measure a pulling force. Gently place an object on the hook and observe how far the spring stretches. For example, observe the spring scale pictured on the next page. How much force is pulling on the object?

Did you say 4 newtons? Good job!

Let’s try another one. Hold the cylinder of a spring scale parallel to the floor. Place the push lever on the object you are going to move. Observe the spring after you start pushing the object. How much force is pushing on the object?

Did you say 1 newton? Correct again!

How do scientists use their knowledge about forces and how forces are measured to conduct experiments?

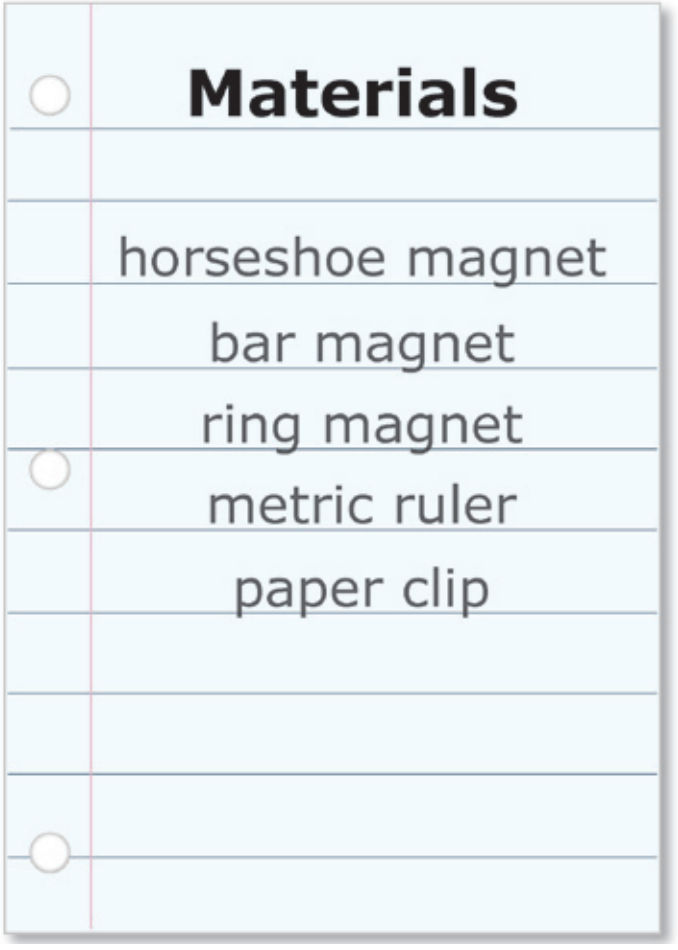
Experimenting

Scientists question the world around them. They research and conduct experiments to try to find answers to their questions.

Think about the experiments you have done before. How did you know what you were going to test? That’s right. You started with a question.

What did you do next? You should have predicted what you thought might happen and why. This is called a hypothesis.

Before you did anything else, you needed a materials list telling you what you would need to conduct the experiment.

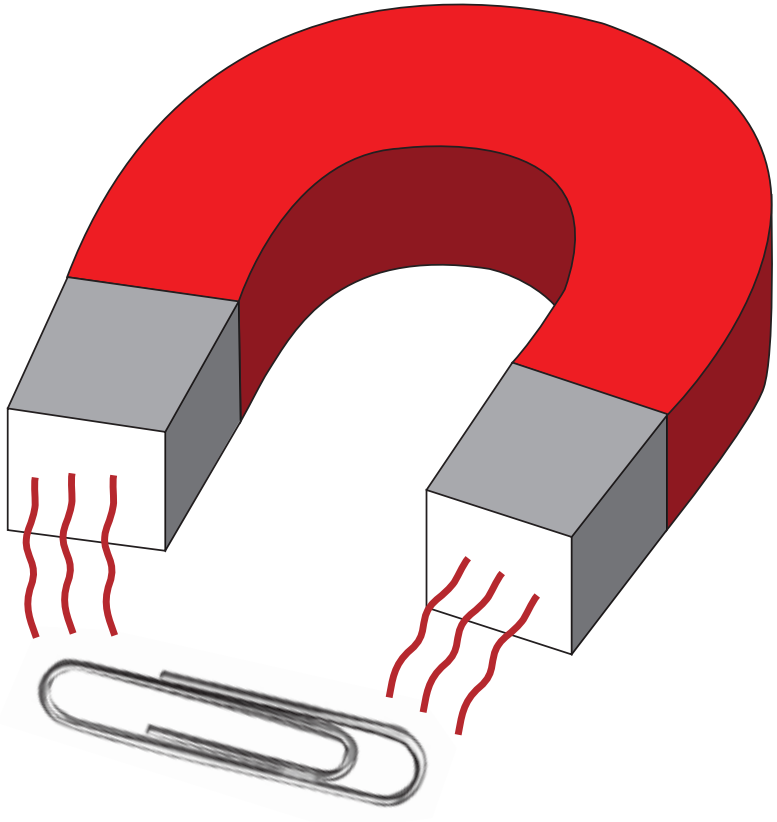


What did you need before you could conduct the experiment?

You needed directions telling you how to do the experiment. In science, we call this a procedure.

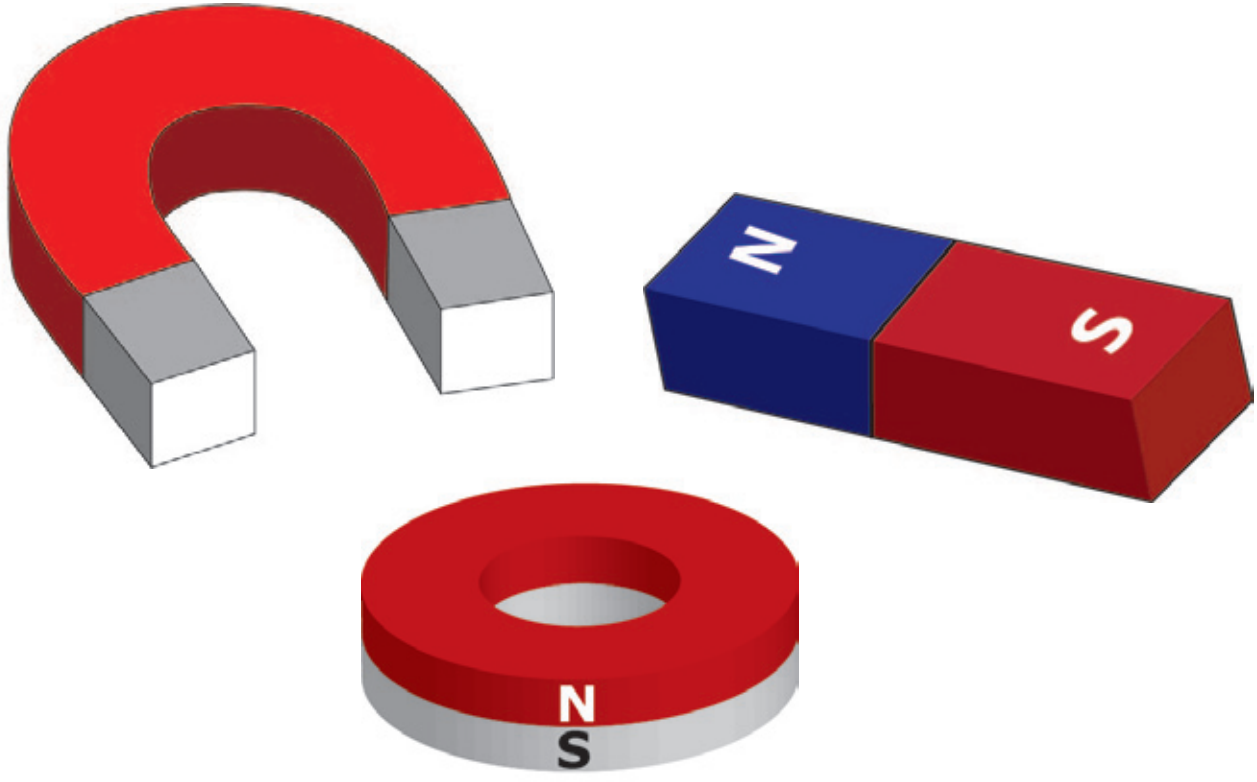
Once you have these things, you can get started! What do you do during the experiment? You should follow the procedure and record data.

What is data? Data includes information, such as observations and measurements, recorded during the experiment. For example, the data in this table tells us how far away the paper clip was from the magnet when it moved on its own.



	Distance Paper Clip Moved toward Magnet (cm)		
Type of Magnet	**Trial 1**	**Trial 2**	**Trial 3**
horseshoe	2	3	2
bar	4	4	4
ring	1	2	3

How do you know if your data is reliable? You would need to conduct the experiment more than once. These repeated experiments are called trials.



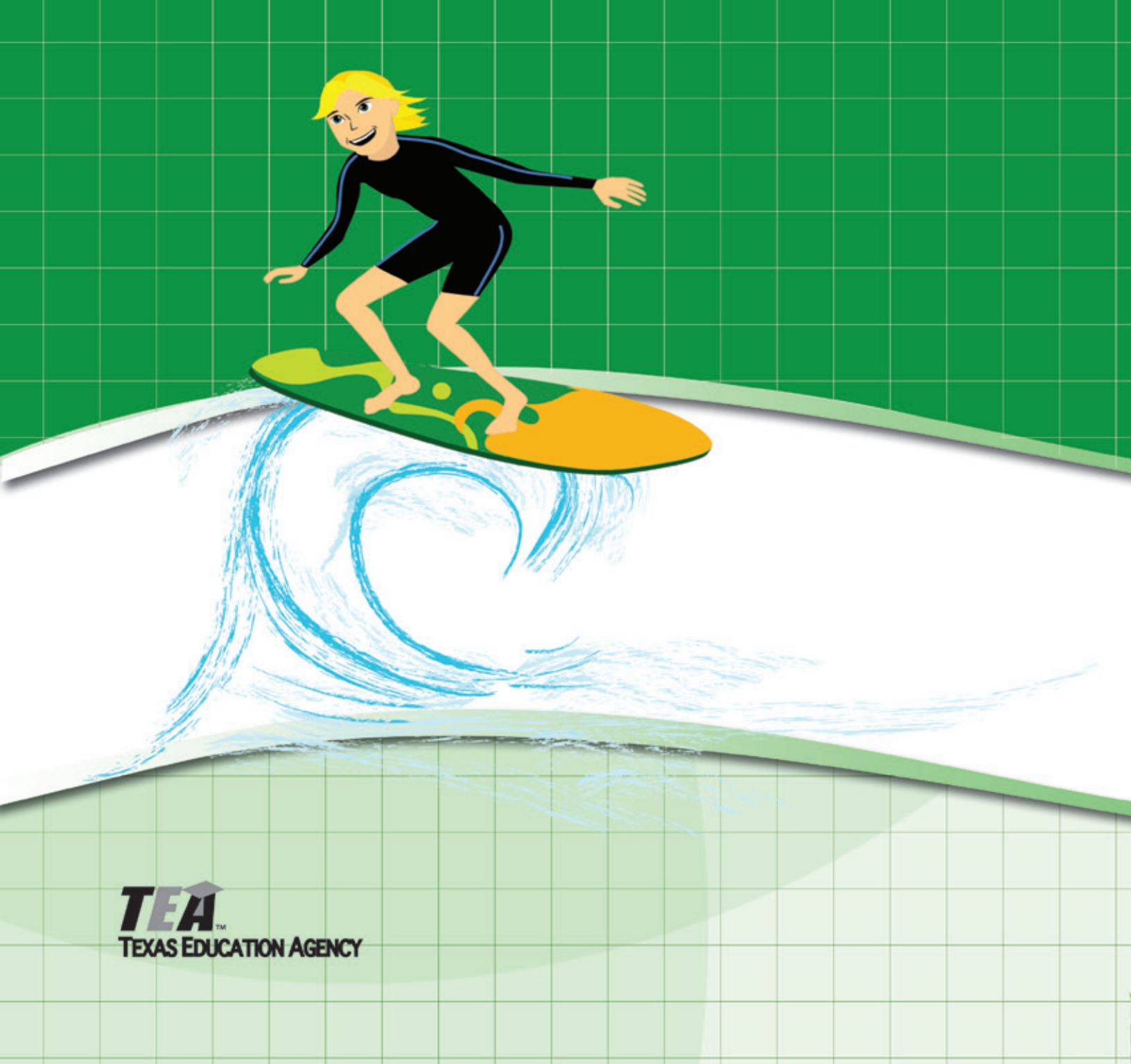
	Distance Paper Clip Moved toward Magnet (cm)			
Type of Magnet	**Trial 1**	**Trial 2**	**Trial 3**	
horseshoe	2	3	2	reliable
bar	4	4	4	
ring	1	2	4	not reliable

If your data is similar for each trial, it is reliable. If your data is different for each trial, you know that something is not right and that your data is not reliable.

Once you have collected reliable data, you can analyze it to find the overall results.

From there, you refer back to your hypothesis to see if you correctly predicted the outcome. You will create a conclusion that summarizes the experiment.

Now that you understand how to conduct an experiment, it is time to start finding answers to your questions.



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