#### Section 2

**Understanding Structures and Mechanisms** 

# PLORAN SZ

# **Spring Force**

Investigate spring force using elastic bands.

We use elastic bands for different purposes - from holding things together to using them as tools for muscle-building exercises. You know that when a stretched elastic band is released, it can snap back to restore its original shape. This is a demonstration of the spring force. The spring force is the force exerted by a compressed or stretched spring upon any object that is attached to it. But is the effort needed to stretch an elastic band the same regardless of how much the elastic band has already been stretched? And what happens when an elastic band can no longer be stretched?

### **Examples of Springs:**



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In this experiment, you will investigate the force needed to stretch an already stretched elastic band.

# **Hypothesis:**

#### Circle the correct word to show your hypothesis.

The more an elastic band is already pulled, the more / less force is needed to stretch it.

#### **Materials:**

- an elastic band
- 8 balloons
- string
- tape

• a ruler

- a bucket

#### • a pencil

#### **Steps:**

- 1. Fill each balloon with about 100 mL of water. Make a knot and tie a string to each balloon's knot.
- Put the elastic band over a doorknob. 2.
- 3. Put a small piece of tape on the door and add an arrow to mark where the base of the elastic band hangs.
- Use the string to tie a water-filled balloon 4. to the elastic band. Place the pail under it to prevent any mess.
- Measure the stretched distance between the 5. new base of the elastic band and the arrow. Record the distance in the table.
- Add another tape with an arrow to the **6**. new base of the elastic band. Add another balloon and repeat Step 5 until all balloons are added or the elastic band breaks. **Record your observations on the next page.**

Wear goggles to protect your eyes in case the elastic band breaks.





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## **My Record**

No. of Balloons	Distance Stretched (cm)	Conclusion:
1		Circle the correct words after conducting the experiment.
		The distances that the elastic stretched <b>increase / decrease</b> as more balloons are added.
		My hypothesis was <b>correct /</b> incorrect .

## **Explanation:**

The distances that the elastic band stretched due to the added balloons were shorter in proportion to the distance stretched by the first balloon, meaning that it was more difficult to stretch the elastic band when it was already pulled. This is because the farther the elastic band was pulled, the more stored energy it had for snapping back to its original shape. Therefore, it took more force to stretch the elastic band. Also, if you happened to stretch the elastic band until it broke, then the elastic band had reached its breaking point. The breaking point was reached when the elastic band could no longer be stretched like a spring; instead, it acted like a rigid object without elasticity. In other words, it had exerted its maximum force, and when more load was added, it reached its breaking point and the elastic band broke.