

## Section 2

### Understanding Structures and Mechanisms

EXPLORATION  
**1**

## Design your own parachute!

Learn how the techniques and materials used in a parachute allow it to fall slowly.

Skydiving, also called parachuting, is an extreme sport in which athletes jump out of an airplane at a high altitude and perform interesting feats in the air. Then, with the parachutes stored in their backpacks, they land on the ground safely.

Parachutes are an important part of skydiving because they make use of air resistance to create a large amount of drag force and allow skydivers to fall at a safe and slow speed. Our smart parachute engineers test all sorts of materials and make many designs of parachutes to ensure that they are strong enough to provide more air resistance to overwhelm the force of gravity. They keep our skydivers safe and allow them to have fun.



If you were a parachute engineer, what materials would you want your parachute to be made of, and what size would you want it to be?

**falls slowly**

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## Design your own parachute!

Try this activity to create parachutes in different sizes with different materials and test their performance.

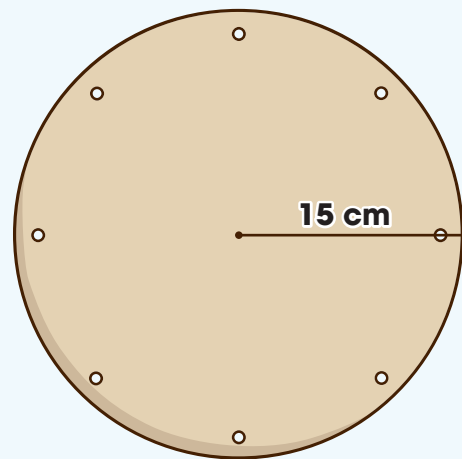
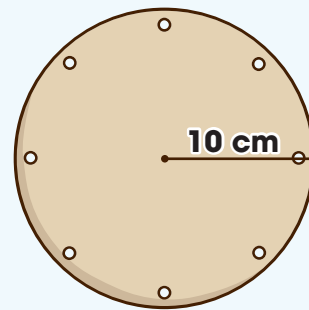
### Materials:

- string
- a small key chain
- a timer
- testing materials for canopy: plastic bag, newspaper, cloth (from an old T-shirt)
- tape
- a hole punch
- construction paper
- a compass
- scissors

### Steps:

1. Make two templates out of the construction paper: a small circle with a radius of 10 cm and a large one with a radius of 15 cm.
2. Make eight points in each circle.
3. Trace the circles on the testing materials to make the canopies and mark the points. Cut out the circles to make six canopies.
4. Make eight holes on each canopy with the hole punch.
5. Cut out 48 pieces of string of the same length. Put them into six groups; each group with eight pieces.
6. Tie a group of strings to each canopy to make a parachute.

### two templates



**eight equidistant points  
on each circle**

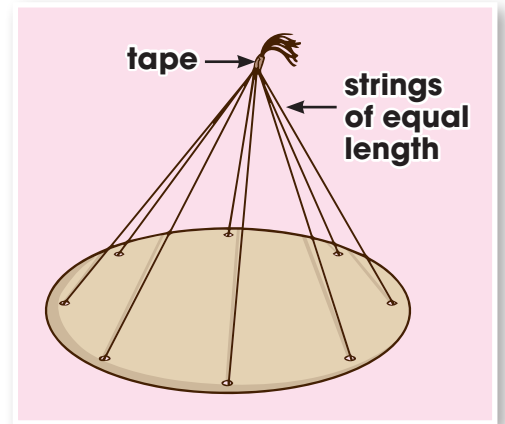
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# EXPLORATION 1

## Design your own parachute!

7. Tape the strings together at the centre of each parachute as shown.
8. Tie the ends of the strings to the key chain.
9. Go outside to test your parachutes one by one. With your arm stretched out, drop the parachute with the key chain. Measure the drop time with a timer. Record the result in the chart below.
10. Detach the key chain. Repeat Steps 8 and 9 with the rest of the canopies.



### Record the drop time.

Canopy	Small	Large
Material		
Plastic Bag		
Newspaper		
Cloth		



To make the results more accurate, you should

- ask a friend for help to measure the time.
- find a higher spot to drop the parachutes from and observe the time difference.

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#### EXPLORATION 1

## Design your own parachute!

Things fall because of gravitational force. At the same time, a falling object also experiences an upward force – air resistance, which slows it down. In the experiment, if no parachute was attached to the key chain, it would fall straight down. However, with the large surface area of the parachute attached to the key chain, the air resistance increased and allowed the key chain to fall slowly. You should have also found that the larger and lighter the material of the parachute is, the slower the key chain falls. This is because the greater the surface area a parachute has, the greater the air resistance it experiences. Also, a good material for a parachute would be one that is durable against air resistance and does not tear in the process of falling. The ideal material should also be lightweight because a heavy material does not allow for as much drag due to its own weight.

