

BALLOON POWERED RACER

A. OVERVIEW

Subject	Science
Age	6-10
Duration	45 minutes
Content	Speed, velocity, Newton's laws of motion
Goals	Students will understand: 1. How to solve problems involving distance, time and average speed. 2. Unbalanced forces cause changes in velocity. 3. When one object exerts a force on another, the second object exerts an equal but opposite force on the first.
Objectives	Students will build a cosmic racer. They will discuss how and why the vehicle moves, and how this science is applied in rockets and jet engines.
Materials	Balloon-powered Cosmic Racer kit
Introduction	Background reading — Motion and forces Class discussion — Speed, velocity and forces
Practical	Students will assemble and test balloon-powered racers.
Extensions	Investigations and discussion points

B. BACKGROUND READING

Set the background reading as a homework assignment the day before the planned lesson.

Review

Start the lesson by reviewing the background reading. Make sure that students understand:

- Speed, velocity and acceleration
- Forces, balanced and unbalanced forces
- That unbalanced forces change velocity

Reading material

Speed is a measure of how far an object moves in a certain time. It is normally measured in metres (or feet) per second, or kilometres (or miles) per hour. Velocity is the speed and direction of an object (e.g. an object moving at 10 m/s to the right has a different velocity than an object moving at 10 m/s to the left). Sometimes we measure average speed. This is the distance an object has moved in a certain time.

Acceleration is a change in velocity (which can be a change in speed or direction, or both).

A force is a push or a pull. It has a size (measured in Newton's) and a direction.

When the forces acting on an object balance each other, the object's velocity does not change (i.e. it carries on moving at the same speed in the same direction, or it remains stationary). If the forces on an object are unbalanced, the object's velocity changes (i.e. its speed or direction changes).

English scientist Isaac Newton (1642-1727) wrote down three laws of motion:

1. Objects don't change velocity unless a force acts on them.
2. The greater the mass of an object, more force is needed to change its velocity.
3. When one object exerts a force on another, the second object exerts a force of equal size but opposite direction on the first.

C. CLASS DISCUSSION

Speed, velocity and acceleration

- What is speed?
- How is speed measured?
- What's the difference between speed and velocity?
- What is a change in velocity called?

Forces

- What is a force?
- Forces have size and direction.
- Examples of balanced and unbalanced forces on objects
- Unbalanced forces change velocity.

Newton's laws of motion

- Examples of each of the three laws

D. PRACTICAL

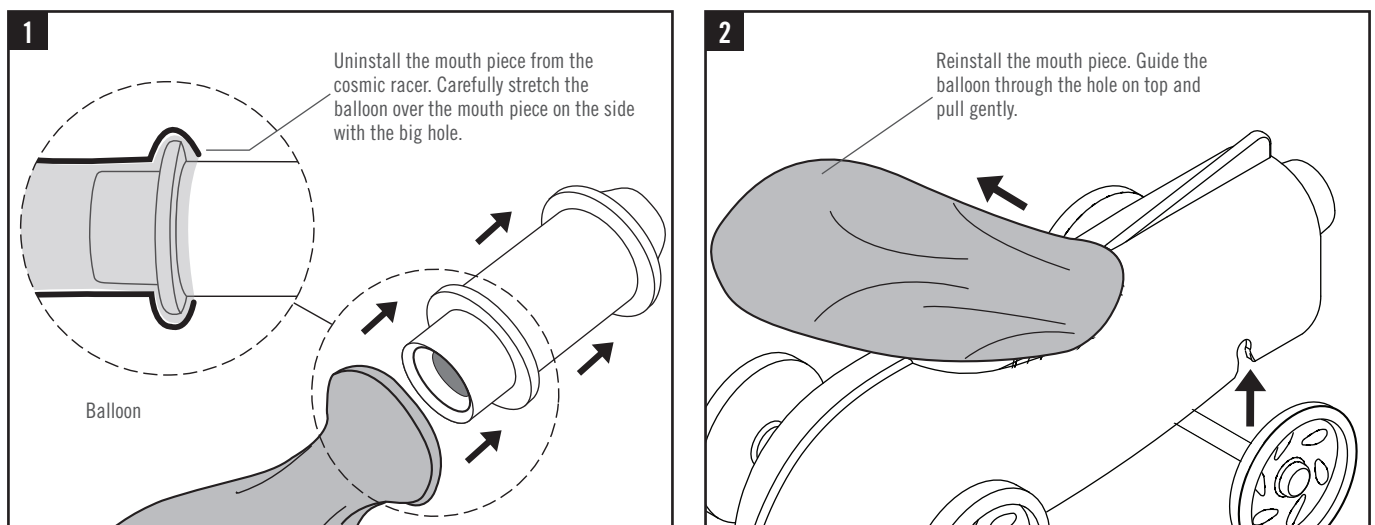
Each group requires 1 kit and 1 instruction sheet.

E. EXTENSIONS

- What pushes the Cosmic Racer along (discuss Newton's third law)?
- How does the Racer's velocity change during a test run?
- Can you think of other examples of Newton's third law in action?
- What slows down the Racer?
- Can you work out the average speed over a test run?
- What would happen if you added some weight to the Racer?
- Where is the stored energy that makes the Racer move?
- What force did Isaac Newton famously discover?

F. INSTRUCTIONS

You may need to photocopy this section and hand out to each group of students if necessary.



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