**teachers guide**

**Forces 3:**

**Balanced and unbalanced forces**

# Components

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|  | NAME | DESCRIPTION | AUDIENCE |
|  | *Balanced and unbalanced forces*teachers guide | This guide suggests teaching strategies to help students understand and explain effects of balanced and unbalanced forces on the motion of objects. | teachers |
|  | *Force builder*learning object | Students use an interactive learning object to predict effects of balanced and unbalanced forces on the motion of objects. | students |
|  | *Finding a balance*worksheet | This student worksheet uses additional examples of balanced and unbalanced forces acting on objects, to allow students to apply their understanding of these concepts. | students |

Purpose

To **Explain** why balanced forces have no effect on motion of objects, whilst unbalanced forces may make them start moving, speed up, slow down or stop.

# Activity summary

Outcomes

Students:

* understand that forces acting on an object may be balanced or unbalanced;
* predict how unbalanced forces change the motion of an object; and
* consider gravity, normal force, applied force, and friction, when predicting the effect of forces on objects.

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| ACTIVITY | POSSIBLE STRATEGY |
| Revise previous **Explore** activities through questions such as:* What do we mean by balanced forces?
* What conditions are needed for two forces to balance each other?
* What effects do balanced forces have on motion of objects?
* What effects do unbalanced forces have on motion of objects?
* Gravity causes objects to fall, what would stop them?
 | whole class or small group discussion |
| With students in small groups, allocate a computer to each group for them to work collaboratively through the learning object, *Force builder*. | small group work on computer |
| Students complete summaries in their notebooks. | working individually |
| Students complete worksheet, *Finding a balance*. | working individually |

# Technical requirements

The teachers guide and worksheet require Adobe Reader (version 5 or later), which is a free download from [www.adobe.com.](http://www.adobe.com/) The worksheet is also provided in Microsoft Word format.

The learning object requires Adobe Flash Player version 8 or later (this is a free download from [www.](http://www/) adobe.com). It can be placed on a web or file-server and run either locally or remotely in a web browser.

# Teacher notes

Concepts to be developed, include:

* Forces acting on an object may be balanced or unbalanced.
* Forces are balanced when they’re equal in strength but opposite in direction.
* Forces have strength and direction.
* Unbalanced forces change motion of objects.
* Gravity, applied force, normal force, and friction, should be considered in relation to moving objects.

The learning object, *Force builder*, explains the concept of forces, and introduces four main forces: gravity, a universal force that acts on all objects on or near the Earth; normal force; friction; and applied force.

Note that the gravity slider can’t be set to its maximum value on the screen dealing with the ‘Shock-drop’. This ensures that a reaction force can be set to a magnitude greater than gravity in order to bring the ride to a halt.

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# Associated SPICE resources

*Forces 3: Balanced and unbalanced forces* may be used in conjunction with related SPICE resources to address the broader topic of forces and motion.

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| DESCRIPTION | LEARNING PURPOSE |
| *Forces (overview)*This learning pathway shows how a number of SPICE resources can be used to teach concepts of balanced forces, unbalanced forces and motion. |  |
| *Forces 1: Introduction to force*A video stimulates students’ interest in learning about forces and motion, and elicits prior knowledge and misconceptions. | **Engage** |
| *Forces 2: Investigating forces*Practical activities provide opportunities for students to explore effects of forces on the motion of objects, including those falling in Earth’s gravity. | **Explore** |
| *Forces 3: Balanced and unbalanced forces*An interactive learning object enables students to explain and predict effects of balanced and unbalanced forces on objects. | **Explain** |
| *Forces 4: Forces in the human body*Students apply their understanding of forces and motion to new contexts, such as: forces in the human body or designing and testing the effectiveness of a safety capsule to protect passengers in motor vehicle collisions. | **Elaborate** |