teachers guide

Forces 3: Balanced and unbalanced forces

Components

	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
Start	*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.

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.

Activity summary

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. 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.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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SPICE resources and copyright

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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.

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**