Name _____ Date _____

Forces and Newton's Laws

Before You Read

Before you read the chapter, use the "What I know" column to list three things you know about forces. Then list three questions you have about forces in the "What I want to find out" column. Later you will fill in the "What I learned" section.

K What I know	W What I want to find out	L What I learned

Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Explain which would be a safer car—a car with a front end that crumples in a crash or one with a front end that doesn't crumple.

Sample answer: A car with a front end that crumples in a crash is safer. It provides a longer distance and a longer time over which a car can decelerate.

Name _____ Date _____

Forces and Newton's Laws

Section 1 Forces

Predict *Read the title of Section 1. List three things that might be discussed in this section.*

1. _____
2. _____
3. _____

Review Vocabulary

Define mass *in a sentence to show its scientific meaning.*

mass Accept all reasonable responses. Mass is a measurement that tells us how much matter is in an object.

New Vocabulary

Use your book or dictionary to define the following terms.

force a push or a pull

net force when two or more forces act on an object at the same time, the forces combine

friction the force that opposes the sliding motion of two surfaces that are touching each other

gravity an attractive force between any two objects that depends on the mass of the objects and the distance between them

field a region of space that has a physical quantity (such as force) at every point

weight the gravitational force exerted on an object

Academic Vocabulary

Use a dictionary to define survive.

range a sequence, series, or scale between limits

Name _____ Date _____

Section 1 Forces (continued)

Main Idea

Details

What is force?

I found this information on page _____.

SE, p. 72
RE, p. 40

Model *an apple hanging from a tree and a falling apple. Include arrows with labels to show all forces acting on the apples.*

Hanging Apple	Falling Apple
Accept all reasonable responses with correct force arrows.	

Analyze *the forces acting on the apple in each drawing and how they combine to form the net force.*

The force of gravity and the force of the stem and tree holding the apple up are balanced, therefore the apple is remaining at rest.

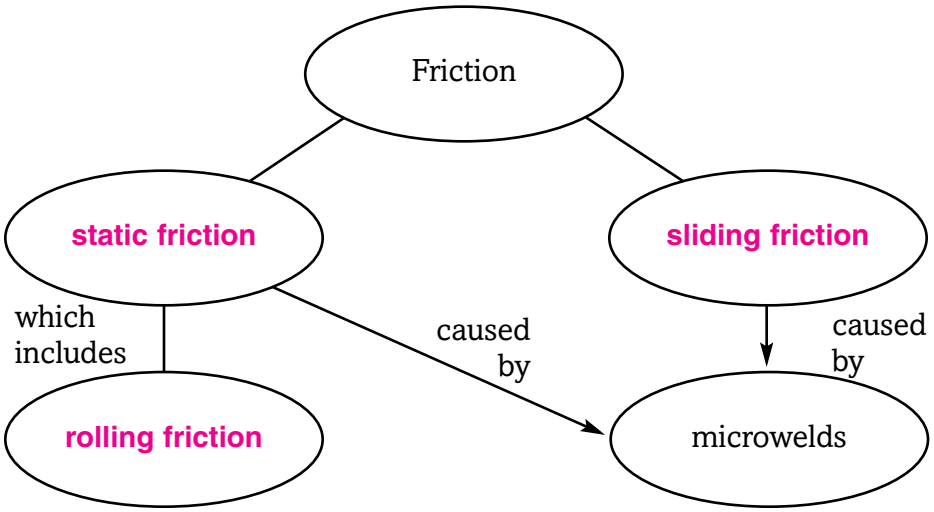
The force of gravity and the force of air resistance are not balanced, therefore the apple's velocity is changing.

Friction

I found this information on page _____.

SE, pp. 74–75
RE, pp. 41–43

Complete *the concept map, using the information in your book.*



Fill in *the blanks to complete the concept of friction.*

The amount of friction between two **surfaces** depends on the **kind** of surfaces and the **force** pressing the surfaces together. Rougher surfaces have more bumps and can form **micro welds**, increasing the amount of friction.

Name _____ **Date** _____

Section 1 Forces (continued)

Main Idea	Details
Gravity *I found this information on page* _____. SE, p. 76 RE, pp. 43–44	**Predict** *why Earth's ocean tides are influenced more by the Moon than by the Sun, even though the Sun is much bigger than the Moon.* Accept all reasonable responses. The Sun and Moon affect Earth's tides through gravity, which depends not only on mass but on distance. The Moon is much closer to Earth than is the Sun, so the effect on Earth's ocean tides must depend more on their relative distances than on their relative sizes.
The Law of Universal Gravitation *I found this information on page* _____. SE, p. 76 RE, p. 44	**Summarize** *the* law of universal gravitation *in a complete sentence.* Accept all reasonable responses. The gravitational force between an object with mass m_1 and another object with mass m_2 is the product of the universal constant, G, and the two masses, divided by the square of the distance between the two objects.
Weight *I found this information on page* _____. SE, p. 78 RE, p. 44	**Write** the definitions of weight and mass in the boxes. Weight Vs. Mass Weight is the force of gravity working on an object's mass. Mass is the amount of matter that an object contains.

Name _____ **Date** _____

Section 1 Forces (continued)

Main Idea

Weight

I found this information on page _____.

SE, p. 78
RE, p. 44

Details

Analyze *the formula* W = mg *to explain how an object's weight can change even when its mass remains constant.* Accept all reasonable responses.

Even though *m* remains constant, *g* can change because it represents the strength of local gravity. If *g* changes, then *W* changes. On Earth, *g* is about 9.8 N/kg, but on the Moon it is 1/6 that. On a larger planet it is greater. In space, far away from any planet or other large body, *g* is essentially zero, and an object has no weight at all, but its mass will not change.

Weight Away from Earth

I found this information on page _____.

SE, p. 79
RE, p. 44

Find *your weight on other planets. Multiply the gravity factor times your mass.* W = mg

Planetary Body	Your mass* (m)	Gravity factor (g)	Your weight in kg (w)
Sun		28	
Mercury		0.4	
Venus		0.9	
Earth		1.0	
Mars		0.4	
Jupiter		2.5	
Saturn		1.1	
Uranus		0.9	
Neptune		1.2	

***To find your mass divide your weight in kg by 9.8.**

Connect It

Explain how Neptune was discovered.

Astronomers noticed that Uranus traveled in an orbit slightly different from its calculated orbit. The astronomers thought that there must be another planet whose gravity was affecting the orbit. Calculations predicted the size and location of Neptune.