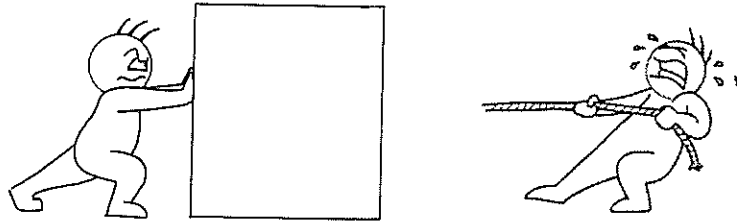
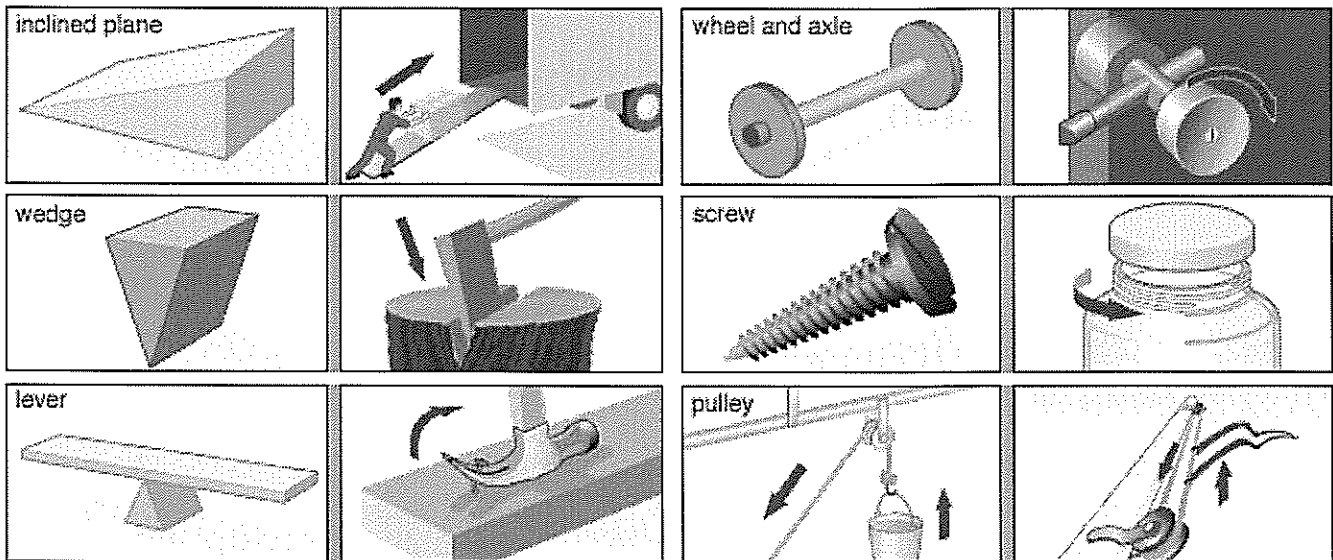


Chapter 12: Forces in Motion

A force is a push or a pull.



Simple Machines make work easier.



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The Chapter 12 test is scheduled for _____.

Review study guide on packet pages 1 and 2, packet pages 8, 9, 10, 11, and book pages 348-349 to prepare for the test.

Name _____ Section _____

Chapter 12: Forces and Motion ---Study Guide

These items can be found in your child's packet in the science section or in their science book. All items have been discussed at length in class. Please refer to the cover of the packet to view which packet pages to study.

Words to Know:

position relative position speed motion force friction gravity work magnetism

***Here is a link to help your child to study the vocabulary for Chapter 12.**

<http://quizlet.com/1022513/scott-foresman-science-grade-3-chapter-12-flash-cards/>

(This link and other links are posted on your science teacher's website.)

Ideas to Know:

- If an object is in a different location, its **position** has changed. The speed and direction of an object's motion can change also.
- The position, direction, and movement of an object often depend on how a person looks at it.
- **Relative position** is the position of one object compared with the position of other objects.
- Speed is the rate, or how fast, an object changes its position. Speed can be fast or slow, and sometimes moving objects do not change how fast or slow they move. They move at a **constant speed**.
- **Variable speed** means that the speed changes. An object moving at a variable speed changes speed as it moves.
- A **force** is any push or pull. A force can change an object's position or the direction of its motion. How much an object changes its direction and speed depends on how much force is used. (If you push harder on a moving shopping cart, it will move faster.)
- **Friction** is a contact force that goes against motion. Friction can cause a moving object to slow down or stop.
- The amount of friction between two objects depends on their surfaces. (Pushing a cart across a smooth surface is easier than pushing a cart across a bumpy surface.)
- A **non-contact force** is a push or pull that can affect an object without touching it.
- **Gravity** is a non-contact force that pulls objects toward each other. The amount that gravity pulls on an object is its weight. An object's weight depends on where it is. (Ex. Since the moon has less gravity than Earth, objects weigh less on the moon than on Earth)
- **Magnetism** is another non-contact force. Magnets pull on, or attract, certain kinds of metal.
- Objects with more matter have more mass. The pull of gravity is greater if the object it is pulling has more mass. Even if the pull of gravity on an object changes, the object's mass remains the same.
- **Work** is moving matter from one place to another. You do **work** when you use a force to move an object. Work is **NOT** done when the position of an object does not change.
- Machines help make work easier. **There are six kinds of simple machines: inclined plane, wedge, screw, lever, wheel and axle, and pulley.**
- An **inclined plane**, or a ramp, is a slanting surface that connects a lower level to a higher level. (ex. screw)

- **Wedges** are used to split, cut, or fasten things. A wedge is a simple machine made up of two slanted sides that end in a sharp edge. (ex. axe, nail, knife)
- A **screw** is an inclined plane wrapped around a center post. Screws are used to hold things together and to raise and lower things. (ex. jar lid)
- A **lever** is a stiff bar that rests on a support. A lever is used to lift and move things. (ex. seesaw)
- A doorknob is an example of a **wheel and axle**. The knob is a wheel and the post that attaches to its center is an axle. (ex. Ferris wheel, merry-go-round)
- A **pulley** changes the direction of motion of an object to which a force is applied. (ex. window blind, flag pole, sails on a sailboat)
- Be able to name at least 2 simple machines that you used today and tell how they make work easier.

Lab zone **Activity**

Can you design a catapult?

Materials

marshmallows

plastic spoons

rubber bands

craft sticks

masking tape

rulers

markers and construction paper

PROCESS SKILL
Making and using models can help you discover a way to move objects with a simple machine.

What to Do

1 Look at the picture of a catapult from medieval times. Study how it works.

2 Design a model of a catapult using the materials provided. You can use all of the materials or just some of them. Your catapult should be able to throw a marshmallow.

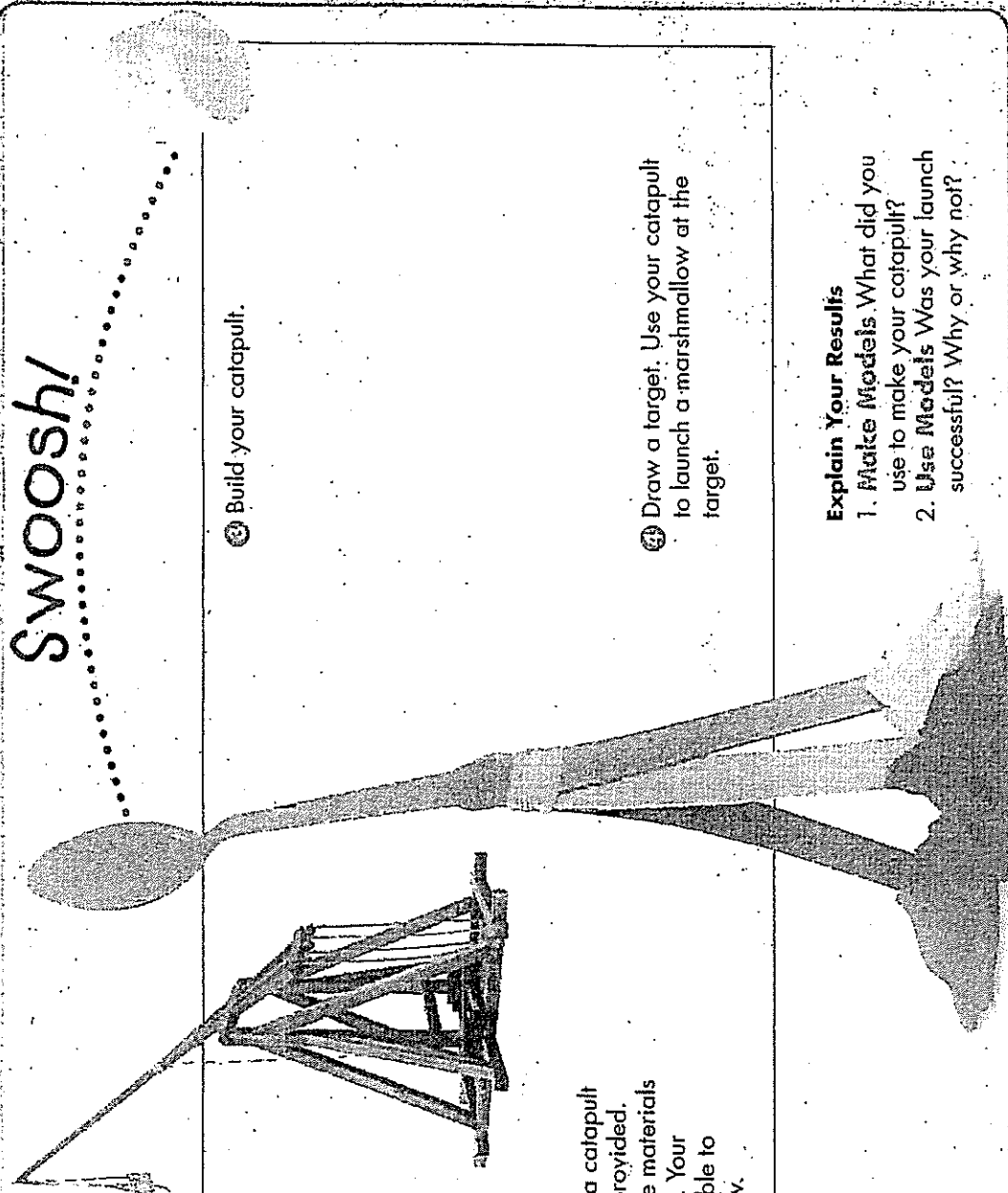
Swoosh!

3 Build your catapult.

4 Draw a target. Use your catapult to launch a marshmallow at the target.

Explain Your Results

1. **Make Models.** What did you use to make your catapult?
2. **Use Models.** Was your launch successful? Why or why not?



Name _____

Can you design a catapult?

Explain Your Results

1. Make Models: What did you use to make your catapult?

2. Use Models: Was your launch successful?

Why or why not?

Explore: How can you describe motion?

Record your observations in the chart below.

| | Speed Moving Down Ramp (increasing or decreasing) | Reach Bottom of Ramp (1 st or 2 nd) | Speed After Reaching Bottom of Ramp (increasing or decreasing) | Distance Moved (longer or shorter) | Average Speed (faster or slower) |
|---------------------------|---|--|--|--|--|
| Ball A (ramp A) | | | | | |
| Ball B (ramp B) | | | | | |

Explain Your Results

1. Which ball moved faster? _____

Describe the location of each ball when it stops moving.
Which was farther from the ramp?

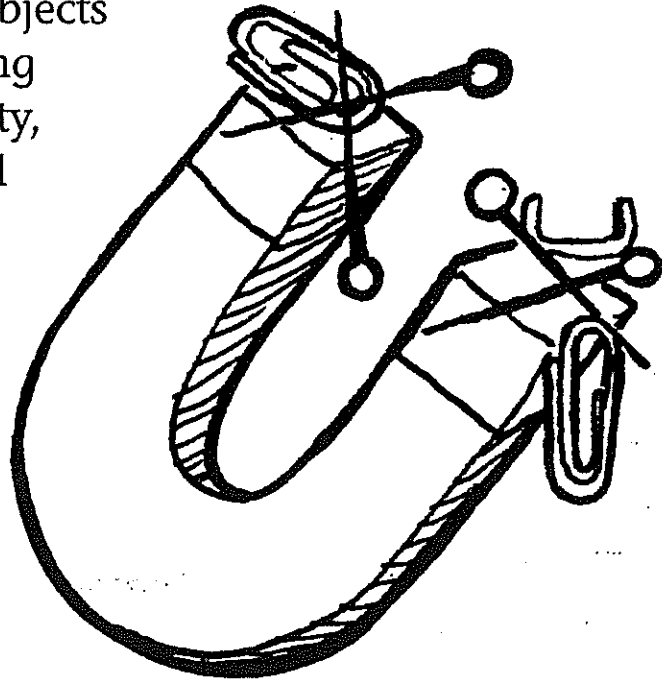
2. **Communicate:** Compare how a ball's speed changes before and after reaching the bottom of a ramp. Describe the 2 types of motion that you **observed**.

Summarize

Read the science article.

Force

Some forces can cause objects to move without touching them. The force of gravity, for example, pulls a ball that you throw back to Earth. Gravity from the Moon and the Sun tugs at the oceans and causes high and low tides. A magnet also exerts a force. It can pull a metal object to itself from inches, or even feet, away.



Apply It!

Fill in the graphic organizer. Write three details and a summary of the article on page 110.

| | | |
|----------------|---------------|---------------|
| Detail | Detail | Detail |
| ↓ | ↓ | ↓ |
| Summary | | |



Notes for Home: Your child learned how to use details in a summary.
Home Activity: With your child, read an article about something in motion. Together decide what are the important details in the article and summarize them.

Write the vocabulary word that answers each riddle.

position

motion

relative position

speed

force

gravity

friction

magnetism

work

1. It tells the location of something. It is specific. Every place on a map has this. What is it? _____
2. It is a force. It opposes motion. It slows moving objects. What is it? _____
3. It is a push or a pull. It can result from two objects coming in contact. It can also result when an object does not touch anything. What is it? _____
4. It locates one thing in relationship to other things. It changes when direction of motion changes. What is it?

5. It pulls objects toward each other. It is a force. It does not require contact. It increases as mass increases. What is it?

6. It is a non-contact force that pulls on, or attracts, metals that have iron in them. What is it? _____
7. This tells how fast something changes position. It is a rate of change. It can be fast or slow. It can be constant or variable. What is it? _____
8. You do this when you move something. Machines can help you do this more easily. What is it? _____
9. Anytime an object changes position, this is involved. When your bike rolls, this would be described as forward. When Earth rotates, this is described as circular. What is it?



Notes for Home: Your child learned the vocabulary terms for Chapter 12.
Home Activity: Ask your child to explain the vocabulary terms to you using photos, diagrams, and other graphics in the chapter to help.

Reviewing Terms: Sentence Completion

Complete each sentence with the correct word or phrase.

- _____ 1. An object's _____ compares its position to the position of other objects.
(relative position, speed)
- _____ 2. An object that is in _____ keeps changing position. (relative position, motion)
- _____ 3. An object's location is its _____.
(position, speed)
- _____ 4. _____ is how fast an object changes position. (Motion, Speed)

Reviewing Concepts: True or False

Write T (True) or F (False) on the line before each statement.

- _____ 5. A map is a drawing of a place that shows the position of objects.
- _____ 6. Words like *forward*, *left*, and *right* can describe the position of an object.
- _____ 7. All objects move at the same speed.
- _____ 8. A constant speed is a speed that is always changing.

Applying Strategies: Calculating

9. If a family biked 18 kilometers in 3 hours, what was their average speed in kilometers per hour? Show your work.
(2 points)

Reviewing Terms: Matching

Match each description with the correct word. Write the letter on the line next to each description.

- | | |
|---|--------------|
| _____ 1. any push or pull | a. magnetism |
| _____ 2. a contact force that goes against motion | b. force |
| _____ 3. a non-contact force that pulls all objects together and all objects toward the center of Earth | c. gravity |
| _____ 4. a non-contact force that pulls on metals with iron in them | d. friction |

Reviewing Concepts: True or False

Write T (True) or F (False) on the line before each statement.

- _____ 5. Forces can change an object's motion.
- _____ 6. Friction can cause a moving object to slow down or to stop.
- _____ 7. Equal forces in opposite directions change an object's motion.
- _____ 8. Weight is the amount of gravity that pulls on an object.

Applying Strategies: Summarize

Use a complete sentence to answer question 9. (2 points)

9. Write a sentence that summarizes how forces affect motion.

Reviewing Terms: Sentence Completion

Complete the sentence with the correct word.

- _____ 1. _____ is done when a force moves an object. (Work, Distance)

Reviewing Concepts: Sentence Completion

Complete each sentence with the correct word or phrase.

- _____ 2. Machines _____ change the amount of work needed to do a task. (do, do not)
- _____ 3. A ramp is an example of a(n) _____. (pulley, inclined plane)
- _____ 4. One example of a _____ is a knife. (wedge, screw)
- _____ 5. An inclined plane wrapped around a center post is a _____. (screw, wedge)
- _____ 6. A seesaw is one kind of _____. (pulley, lever)
- _____ 7. A doorknob is a(n) _____ that makes opening a door easier. (wheel and axle, inclined plane)
- _____ 8. You can use a _____ to change the direction of your force. (pulley, wedge)

Writing

Use complete sentences to answer question 9. (2 points)

- 9. Write a paragraph that tells about a time when you used a simple machine to make work easier.

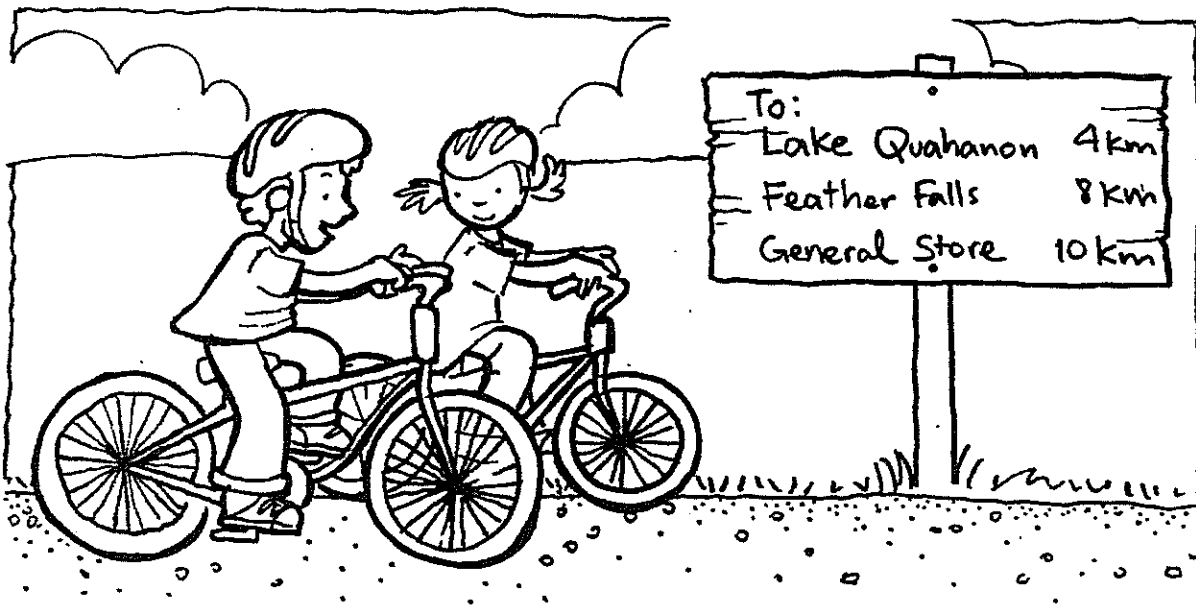
Relating Speed, Distance, and Time

Use the formulas to solve the word problems.

$$\text{Distance} = \text{Time} \times \text{Speed}$$

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$



1. Dennis and Anita rode their bikes an average speed of 8 km per hour. How long did it take them to get to Feather Falls? _____
2. They rode to the General Store and back. It took them 2 hours. How fast did they ride? _____
3. If Dennis and Anita ride to all three places and back, one at a time, and it takes them 4 hours, what was their average speed? _____



Notes for Home: Your child learned to calculate speed, distance, and time.
Home Activity: Walk, drive, or ride with your child to a location whose distance you know. Measure the time it takes. Then calculate your average speed.

Vocabulary Practice

Read the story and underline the vocabulary words wherever they appear.

José said, "Watch me work. My body will be a force that makes this rock move with speed down the hill."

"You can change the position of the rock with your body?" Anna asked.

"Of course," José boasted.

Anna added, "Gravity can also pull a rock down a hill." Anna pulled a magnet out of her backpack. "Magnetism can change the position of a rock, too." Anna placed the magnet by a rock. It turned to the right.

"Wow!" José exclaimed.

Anna smiled and said, "Now, let's see you move that big, big rock all by yourself."

Finding Work

Work is when you use force to move an object. **Look** at the pictures below. **Circle** the pictures that show work being done.

