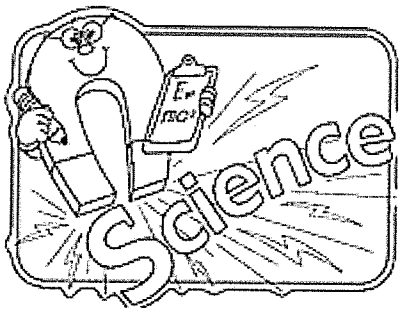
Name:_____

College:_____

4th Grade SCIENCE



Week of 6/1-6/3

Spelman College®

1867 HOWARD UNIVERSITY

Tuesday

Date: June 1

Learning Target: I can identify what causes motion (push and pull)

Learn by Reading

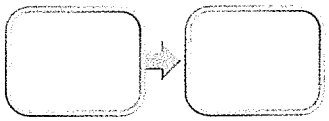
Forces

VOCABULARY

force	p. F73
gravity	p. F74
motion	p. F72

READING SKILL

Cause and Effect Use a chart to describe the effect of each force that you read about.

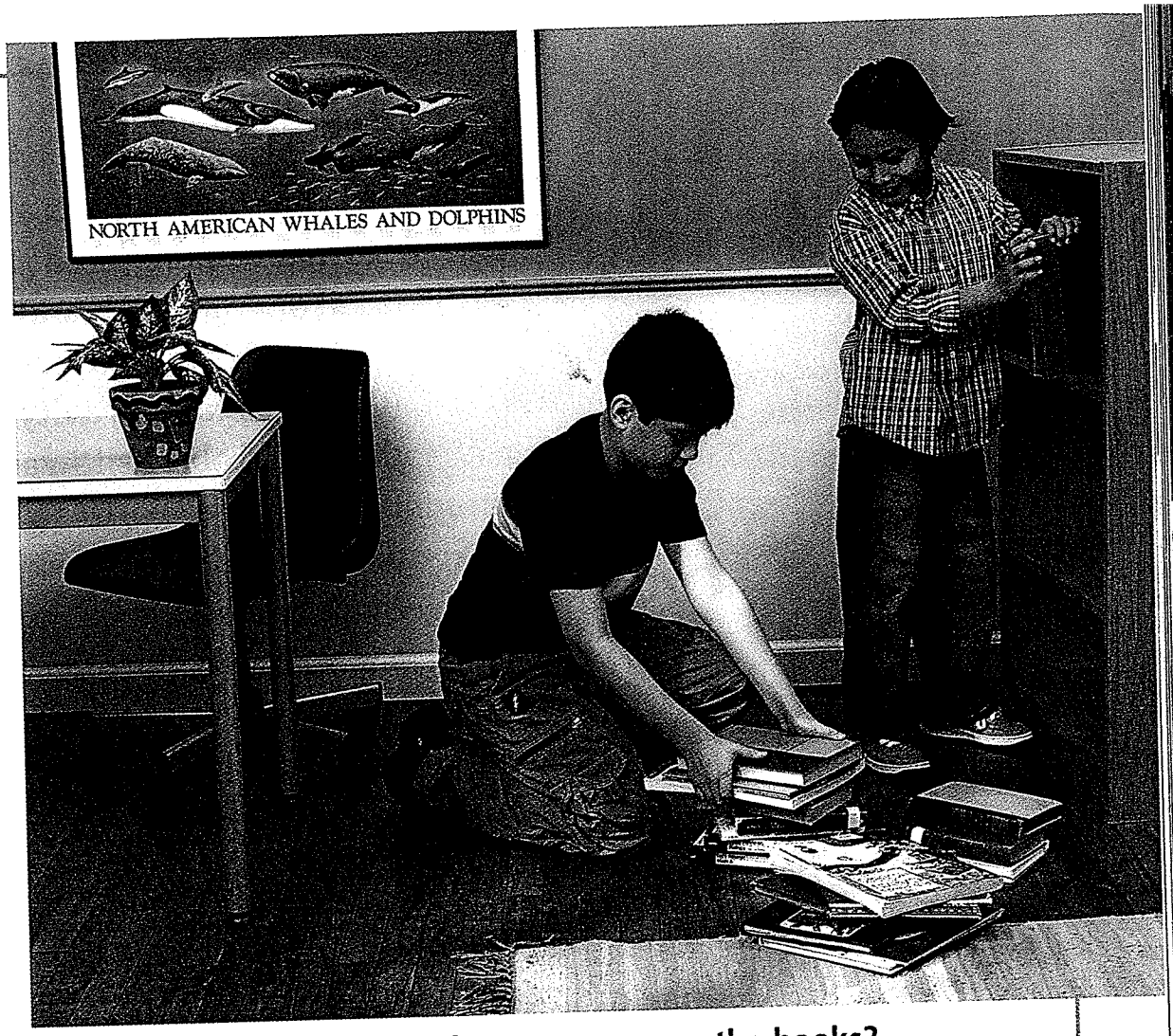


MAIN IDEA **Forces can change the motion of objects. Gravity, magnetism, and friction are forces.**

Motion, Pushes, and Pulls

Suppose your chair is next to the wall, but you want the chair to be near your desk. How would you get it there? You would move it, of course. Moving it would change its position, or place. The change in position of an object is called **motion** (MOH shuhn). Motion occurs any time an object moves from one position to another. The furniture in the room shown is in motion. The children who are moving the furniture are also in motion.

These children are using forces to move the furniture in the room.



How are the children using forces to arrange the books?

Think again about moving your chair. To change the chair's position, you would have to use a force on it. A **force** (fawrs) is a push or a pull. A push moves an object away from you. A pull moves an object toward you.

Any change in motion needs a force. You use a force to start a motion. You also use a force to speed up, slow down, or stop a motion. And you use a force to change the direction of a motion. Using a stronger force causes a bigger change in the motion.

CAUSE AND EFFECT **What is needed to change a motion?**

Gravity

What force affects all matter on Earth, even air? What force keeps juice in your glass and your glass on the table? The force is gravity (GRAV ih tee). **Gravity** is a force that pulls objects toward each other. For example, Earth's gravity pulls objects toward the center of Earth. It causes objects to fall to the ground and water to flow downhill. Gravity exists between all objects, not just between Earth and other objects.

Gravity acts on objects without touching them. For example, Earth's gravity pulls on objects in space, such as the space shuttle or the Moon. The strength of gravity depends on the mass of each object. There is more gravity between objects that have greater masses. Earth has a large mass, so there is a strong pull between Earth and other objects on or near it.

An object's weight is a measure of how strongly Earth's gravity pulls on the object. Objects with greater mass are heavier than objects with less mass.

◀ **Gravity pulls the glass toward Earth. The force of gravity is strong enough to break the glass as it strikes the floor.**

Magnetism

Magnetism (MAG nih tihz uhm) is a force that pushes or pulls objects made of iron or nickel. It has little effect on objects made of other materials. All magnets have two poles: a north pole and a south pole.

Unlike poles pull toward each other. When the north pole of one magnet is brought near the south pole of another magnet, the magnets pull together. Like poles push away from each other. A magnet's force is strongest at the poles. Like gravity, magnetism can act on an object without touching it.

CAUSE AND EFFECT **How does an object's mass affect its gravity?**

Like poles of magnets push away from each other.

Unlike poles of magnets pull toward each other.

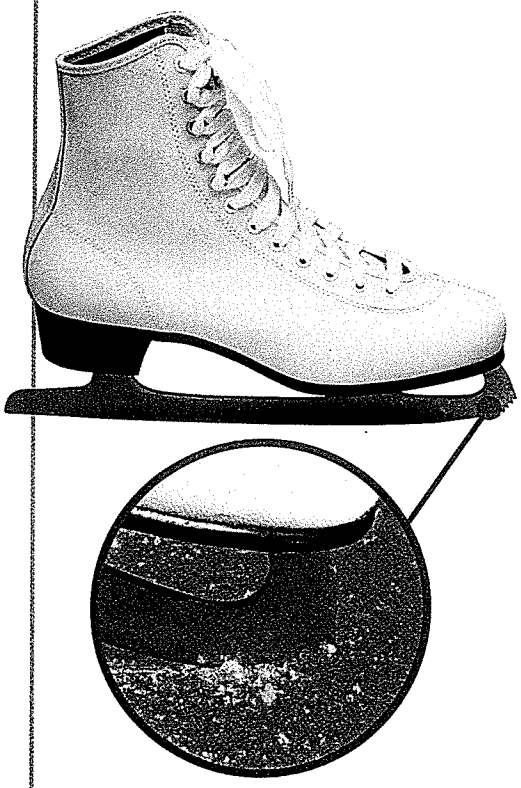
The globe "floats" in the air because magnets in the globe push away from magnets in the stand.

Friction

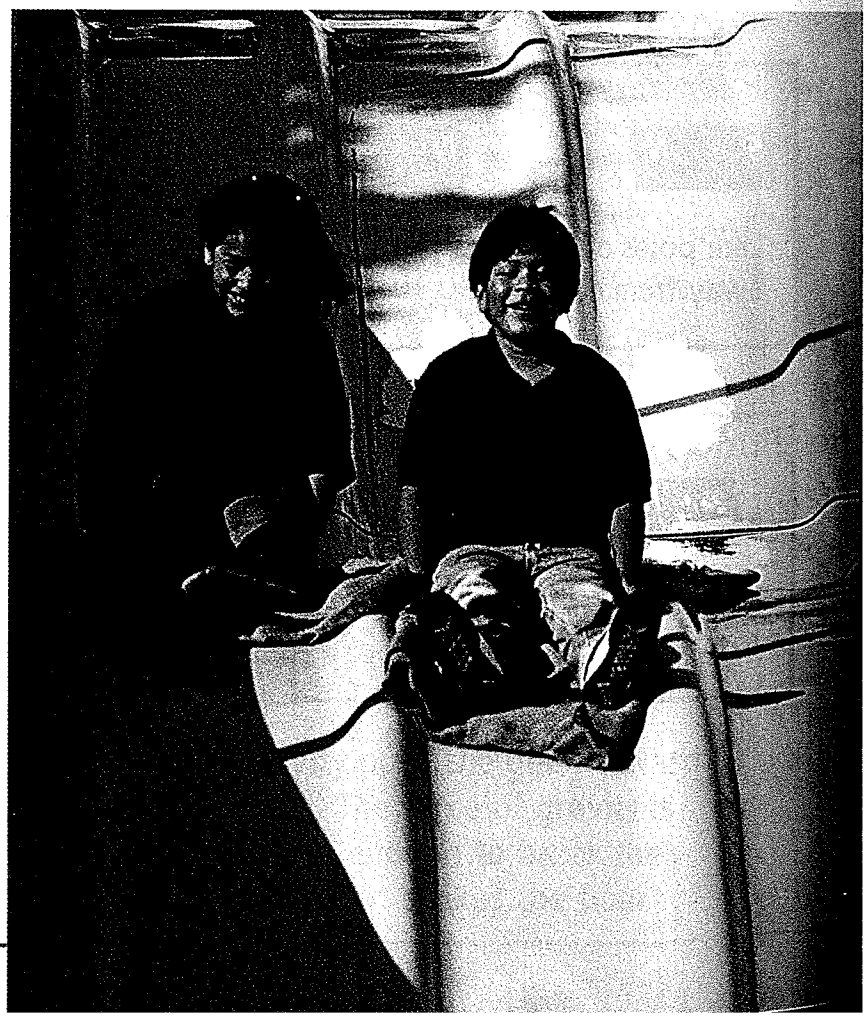
Friction is a force that slows down and stops motion between two surfaces that touch. There is more friction between rough or sticky surfaces than there is between smooth or slippery surfaces.

Friction can be useful. Without friction, your feet would slip and slide on the floor when you tried to walk. Sometimes friction is not useful. Friction can slow down machines and wear out their parts. Many machines use oil to make surfaces slippery and reduce friction.

CAUSE AND EFFECT **What types of surfaces have less friction between them?**



▲ The smooth blade of the ice skate reduces friction between the blade and the ice. The rough tip increases friction. It helps the skater to start and stop on ice.



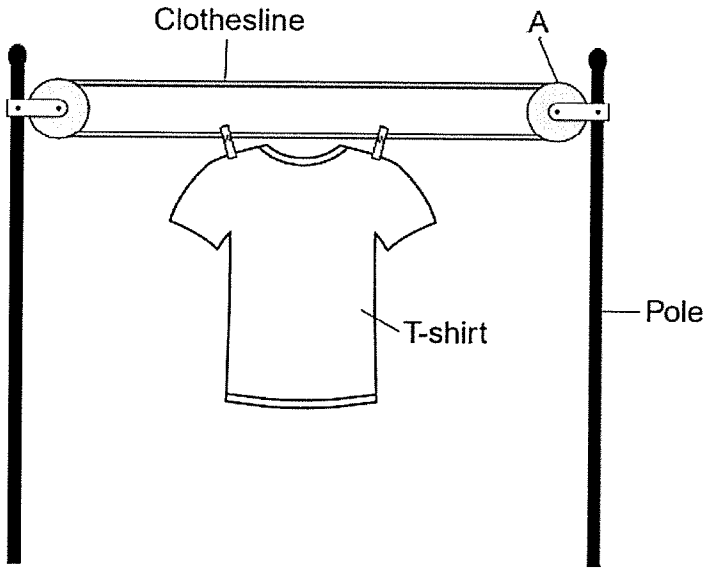
The soft cloth and smooth slide reduce friction, allowing a fast ride. ▶

EXIT TICKET

Name:_____	**Date:**_____
BCCSG	**Howard / Spelman**

1. It is harder to push a box up a ramp with a rough surface than up one with a smooth surface because the rough surface provides more
   A motion
   B friction
   C gravity
   D magnetism

2. The diagram below shows a T-shirt hanging on a clothesline. Letter A represents a simple machine.



Which type of simple machine is represented by letter A?
A lever
B balance
C pulley
D inclined plane

Grade:

Wednesday

Date: June 2

Learning Target: I can predict ways to increase and decrease speed

REVIEW

Learn by Reading

Moving Objects

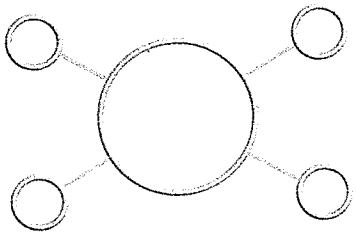
MAIN IDEA **You can describe the motion of an object by its distance, direction, and speed.**

VOCABULARY

direction	p. F83
distance	p. F82
speed	p. F84

READING SKILL

Text Structure
Complete a word web. Write the term *motion* in a center circle. Write a main idea from each section of the lesson in outer circles.



Position and Motion

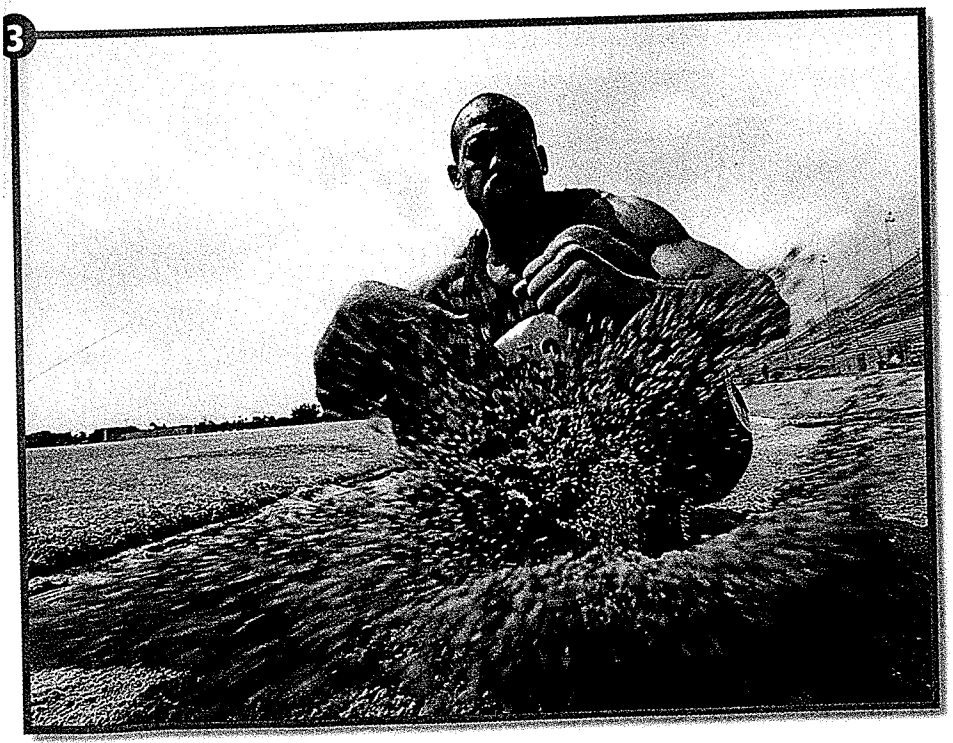
Motion is a change in position. You can describe an object's position by comparing it to other objects around it. The athlete in the photo stands behind the foul line before he starts to run. As he moves, his position changes. He moves closer to the foul line, then leaps above it. Finally, he comes down in the landing pit.

Motion can change the potential and kinetic energy of objects. For example, the athlete has more potential energy when he is above the ground than when he is on the ground. He also has more kinetic energy when he runs than when he moves more slowly.

Every change in motion needs a force. A force is a push or pull that passes energy between two objects. Some forces, such as gravity and magnetism, can pass energy between objects even when the objects are not touching. Other forces, such as friction, can pass energy between objects only when the objects are touching.

What forces change the motion of the athlete? The athlete pushes against the ground to run. He also pushes against the ground to lift himself into the air. He uses friction between the sand in the landing pit and his feet to stop.

TEXT STRUCTURE **What would be a good section title for the text on this page?**



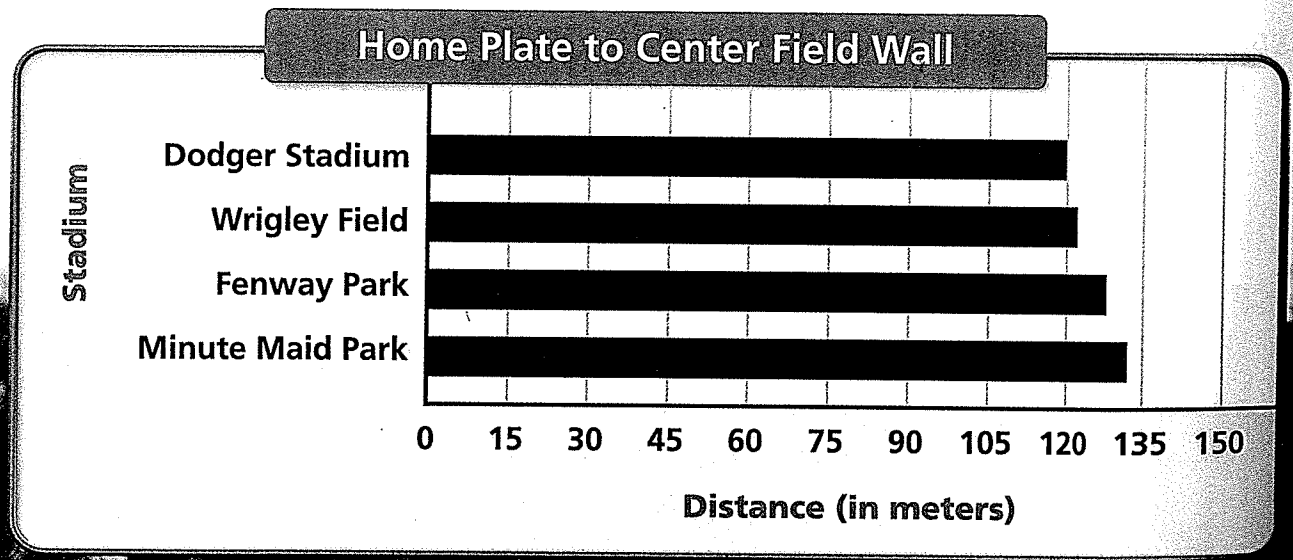
The position of the long jumper changes from the time he leaves the ground to the time he lands.

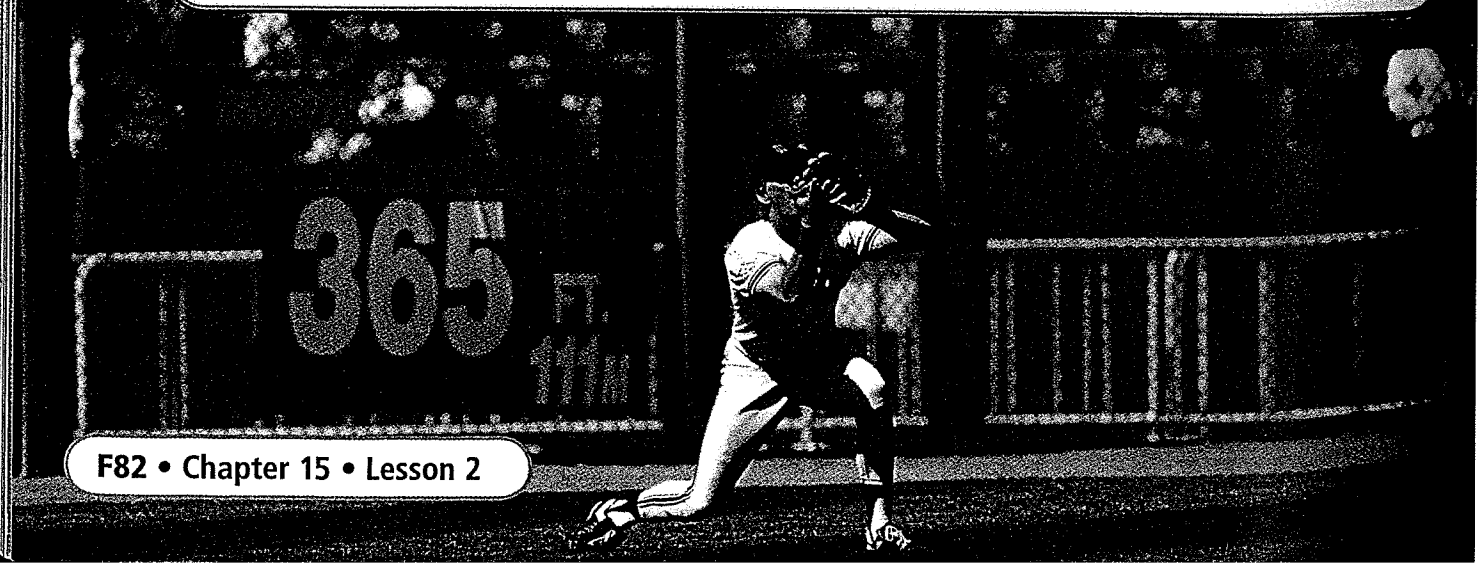
Distance

Distance (DIHS tuhns) is a measure of length. You can describe the motion of an object by measuring the distance it travels. For example, a baseball player hits a ball at home plate. The ball travels to the center field wall. You can find the distance the ball traveled by measuring the distance from home plate to the center field wall.

When you apply a greater force, an object travels a longer distance. The distance a ball must travel to hit the center field wall varies for different ballparks. The distance from home plate to the center field wall at Fenway Park is greater than it is at Dodger Stadium. So, a player must hit the ball harder for it to reach the center field wall at Fenway Park than at Dodger Stadium.

How far must a baseball be hit in Wrigley Field to hit the center field wall?



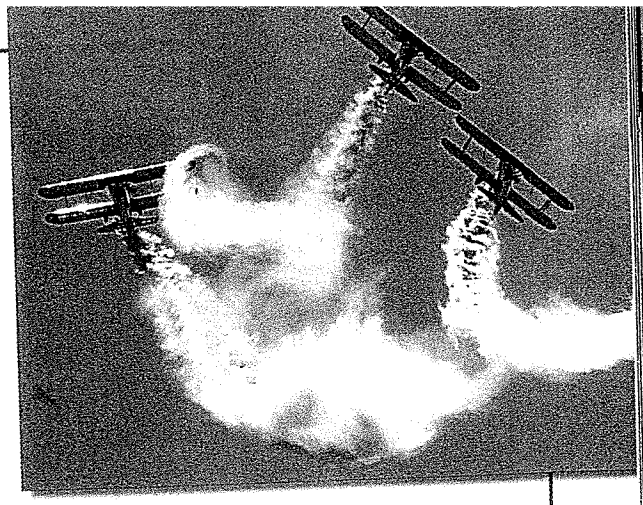


Direction

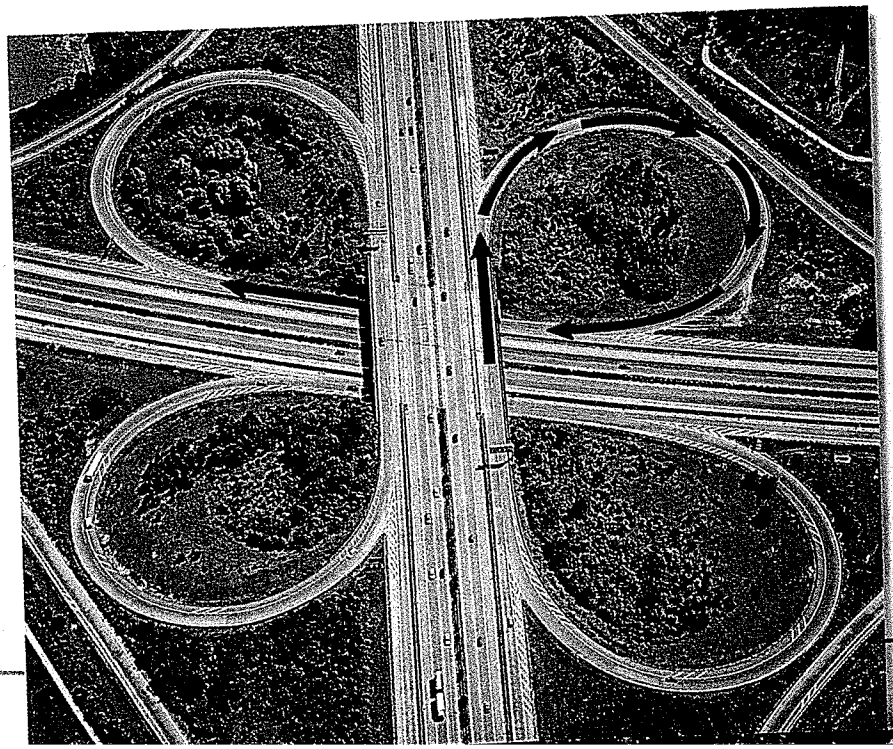
Direction (di REHK shuhn) is the path an object follows. You can use direction to describe the motion of an object. Direction tells where the object is going. You can find the direction of an object by comparing its position now with its position at an earlier time.

Look at the photos. You can find the direction of the cars or planes by comparing their positions now with their earlier positions. You could describe the direction of a plane or car by saying that it is moving east or turning right. Like other changes in motion, a change in direction is caused by a force.

TEXT STRUCTURE **Based on the headings, identify two ways to describe the motion of an object.**



▲ **You can describe the motion of the planes by describing the direction of their movement.**



◀ **The cars entering and exiting this highway are traveling around curves. Their direction keeps changing as they turn.**

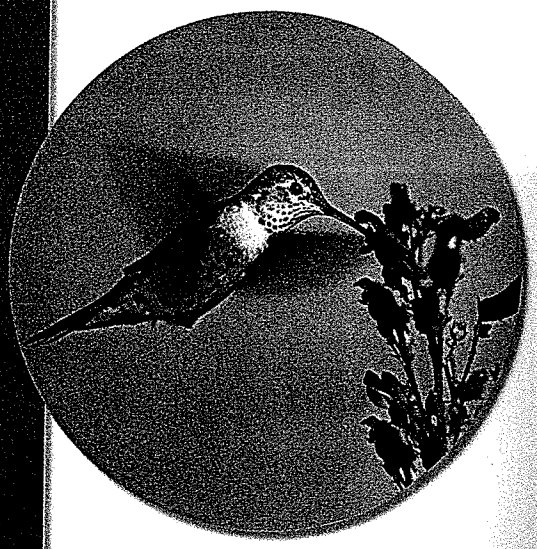
▲ Sloths are known for their slow speed. A sloth travels only about 0.2 km (0.1 mi) in an hour.

Speed

Speed is a measure of how fast or slow an object is moving. Speed is another way to describe motion. Look at the animals shown. A cheetah is one of the fastest animals, and a sloth is one of the slowest. Some objects, such as a plant bending toward the light, move so slowly that you cannot see their motion. You know the object has moved only when you see that its position has changed over time. You can measure speed by finding the distance an object travels in a certain time. For example, a cheetah can run almost 30 m (98 ft) in one second.

TEXT STRUCTURE **How is speed related to motion?**

A hummingbird's wings move so quickly that they look like a blur. ▼



◀ Cheetahs are the fastest animals on land. Some cheetahs can run almost 2 km (1 mi) in 1 minute.

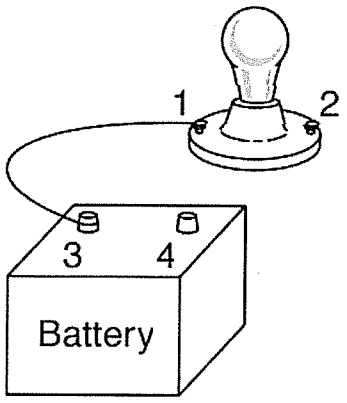
EXIT TICKET

Name:_____	**Date:**_____
BCCSG	**Howard / Spelman**

1. The diagram below shows a person using a simple machine to lift a box.
   The box is being lifted with the help of
   A an inclined plane
   B a magnet
   C a pulley
   D a lever

2. A student rubs her hands together. Her hands will feel warmer due to heat produced by
   A erosion
   B friction
   C gravity
   D sunlight

3. The diagram below shows an open circuit. The bulb is not lit. Four places in the circuit are labeled 1, 2, 3, and 4. One wire has been connected between 1 and 3.



   In order to light the bulb, another wire should be connected between
   A 1 and 2
   B 1 and 4
   C 2 and 3
   D 2 and 4

Grade:

Thursday

Date: June 3

Learning Target: **I can describe the position of an object by comparing it to the position of another object**

Focus On

Primary Source

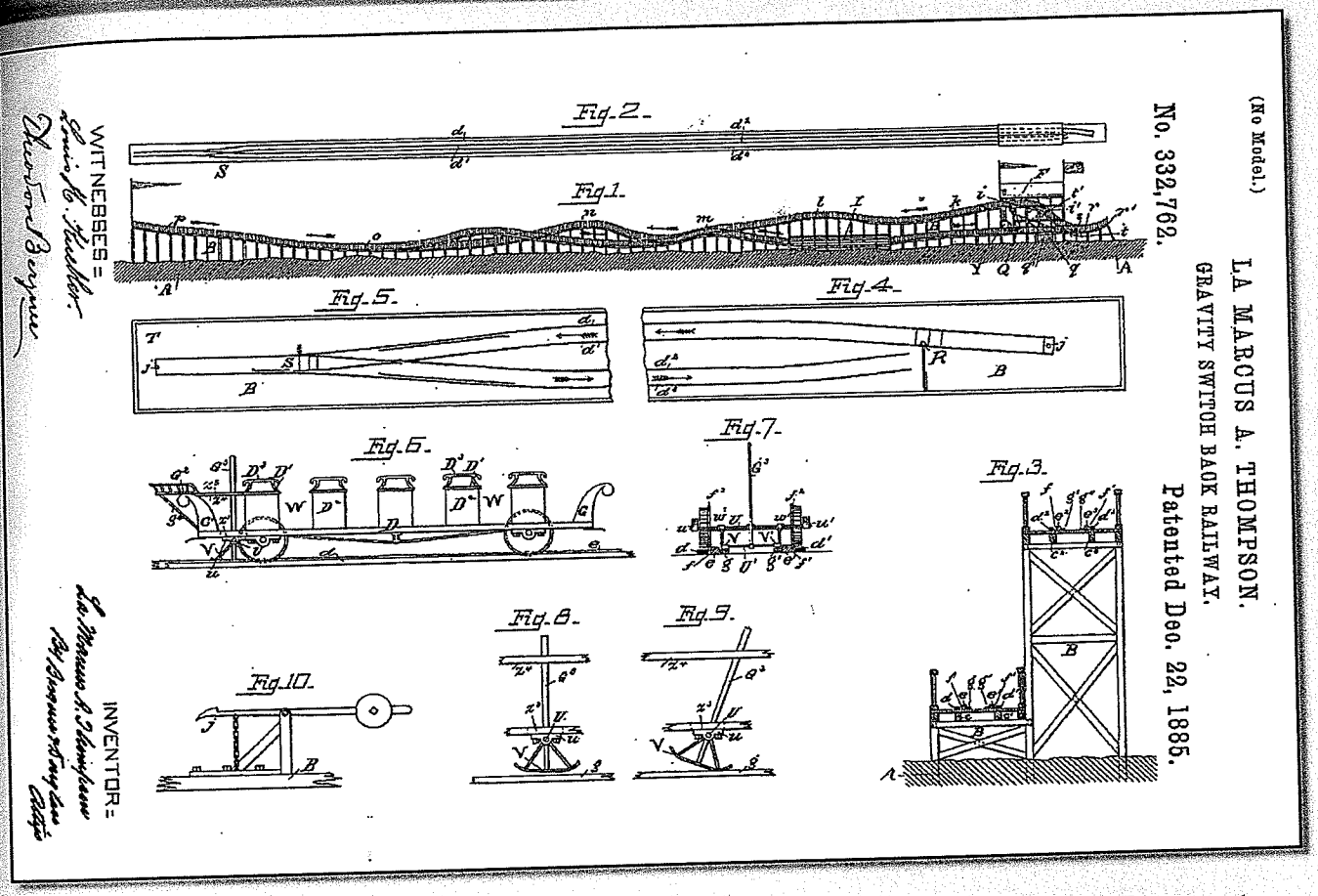
Ups and Downs

Wheeeeee! In 1884, shouts of excitement rang through the air at Coney Island, New York. The first gravity-powered roller coaster raced up and down over tracks.

The *Gravity Switchback Railway*, as it was called, traveled at almost 10 km (about 6 mi) in an hour. The train had two flat steel tracks that were nailed to wooden planks. It used the force of gravity to move. The ride started up high, and the car picked up speed as the tracks dipped.

The riders had to do some work, too. To board the roller coaster, they had to climb stairs to a platform at the top of the first hill. At only five cents a ride, getting a thrill and some exercise was a bargain!

This painting shows what it was like to ride a roller coaster in the 1800s.


(No Model.)

L.A. MARCUS A. THOMPSON.

GRAVITY SWITCH BACK RAILWAY.

No. 332,762. Patented Dec. 22, 1885.

Fig. 2.

Fig. 1.

Fig. 5.

Fig. 4.

Fig. 6.

Fig. 7.

Fig. 3.

Fig. 8.

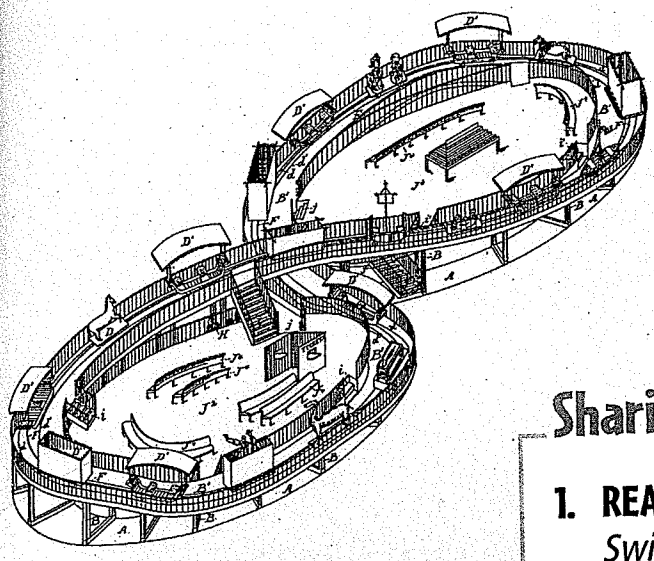
Fig. 9.

Fig. 10.

WITNESSES=

INVENTOR=

▲ LaMarcus Thompson's 1885 patent describes the materials and design of the *Gravity Switchback Railway.*



▲ Thompson designed many other coasters. This is a drawing from his patent for the *Pleasure Cable Railway.*

Sharing Ideas

1. **READING CHECK** Where was the *Gravity Switchback Railway* located?
2. **WRITE ABOUT IT** What force did Thompson's roller coaster use to move?
3. **TALK ABOUT IT** Discuss how it may have felt to ride on the first gravity-powered roller coaster.

Learn by Reading

Simple Machines

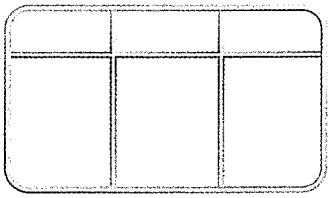
MAIN IDEA **Simple machines make work easier by changing the strength or direction of a force.**

VOCABULARY

inclined plane	p. F94
lever	p. F91
pulley	p. F93
screw	p. F95
simple machine	p. F90
wedge	p. F95
wheel and axle	p. F92
work	p. F90

READING SKILL

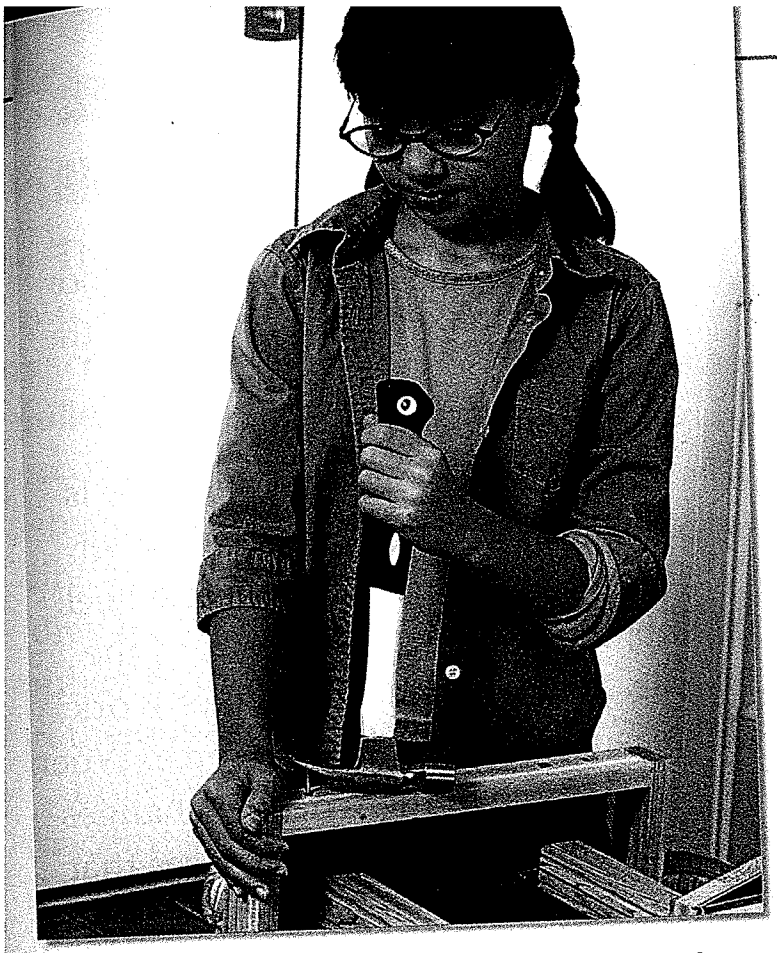
Classify Use a chart to classify simple machines by the way they change a force. They may change the strength of a force, the direction of a force, or both.



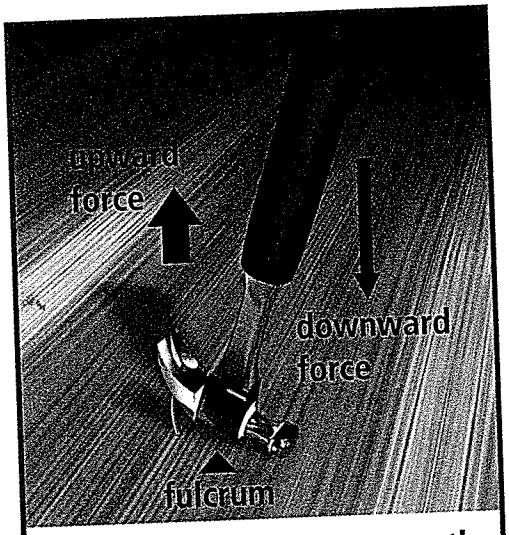
Machines and Work

What do you think of when you hear the word *machine*? Maybe you think of huge machines on farms or in factories. Perhaps you picture many gears and other moving parts. Did you know that some machines are very small and do not have any moving parts? A machine is any tool that makes work easier. In science, the word *work* has a special meaning. **Work** is the movement of an object by a force. A **simple machine** is a device that makes work easier. A simple machine changes the force that is needed to move an object. It changes the strength of the force or its direction.

This girl uses a hammer to do work. The force of the hammer moves the nail. ▶



Using the hammer as a lever makes it easier to pull the nail from the wood.



A lever changes the strength and direction of a force.

Lever

Do you think you could pull a nail out of wood using only your fingers? It would be hard to do. But it is easy to pull out a nail using a hammer. A hammer can be used as a simple machine called a lever (LEHV ur). A **lever** is a simple machine made up of a stiff arm that can move freely around a fixed point. The fixed point of a lever is called the fulcrum (FUL kruhm). You apply a weak force to the handle of the hammer. The lever changes the weak force on the handle to a strong force on the nail. It also changes the direction of the force. These changes in the strength and direction of the force make it easier to remove the nail.

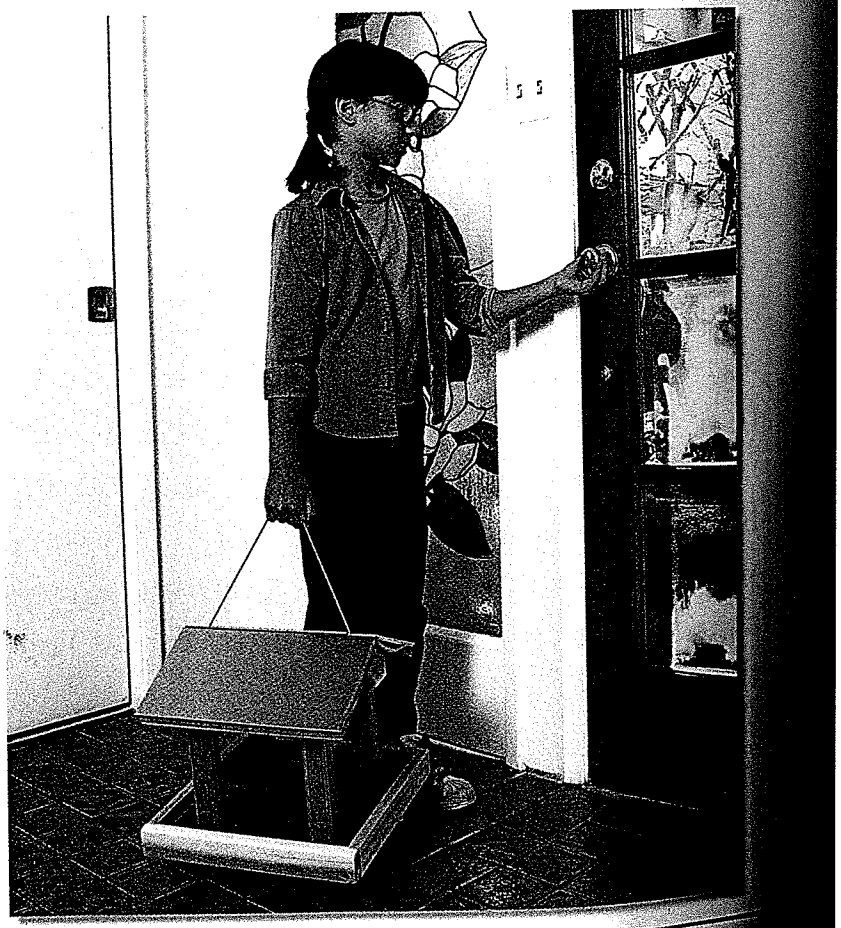
CLASSIFY **What type of simple machine is a hammer when it is used to remove a nail?**

Wheel and Axle

How do you open a door? You turn a doorknob, which moves the latch, and the door opens. The doorknob makes it easy to move the door latch.

A doorknob is a simple machine called a wheel and axle (AK suhl). A **wheel and axle** is a simple machine made up of a small cylinder, or axle, attached to the center of a larger wheel. On a doorknob, the knob is the wheel and the shaft is the axle. A wheel and axle makes work easier by increasing the strength of a force. When you apply a weak force to the wheel, it changes to a strong force on the axle. Other devices that contain wheels and axles include faucets and steering wheels.

A wheel and axle changes the strength of a force but not its direction.



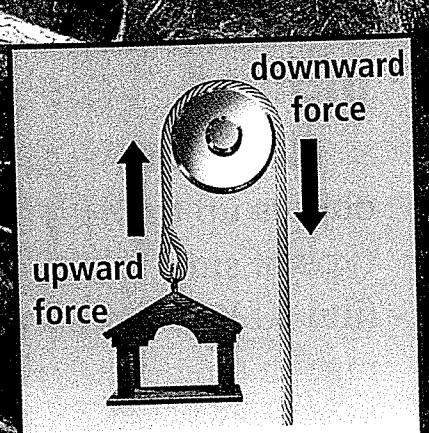
A doorknob is a wheel and axle. Applying a weak force to the knob (wheel) creates a strong force on the shaft (axle). ▶

ulley

The man is lifting a birdfeeder nto the tree with another simple nachine, a pulley (PUL ee). A **ulley** is a simple machine made p of a rope fitted around a fixed vheel. A pulley changes the lirection of a force. You apply a orce in one direction. Then the ulley changes it to an equal force n the opposite direction.

Pulleys and other simple machines can be combined to make complex (kuhm PLEHKS) machines. For example, a bicycle contains pulleys, wheels and axles, and levers.

CLASSIFY **What type of simple machine that contains a wheel would you use to change the direction of a force?**

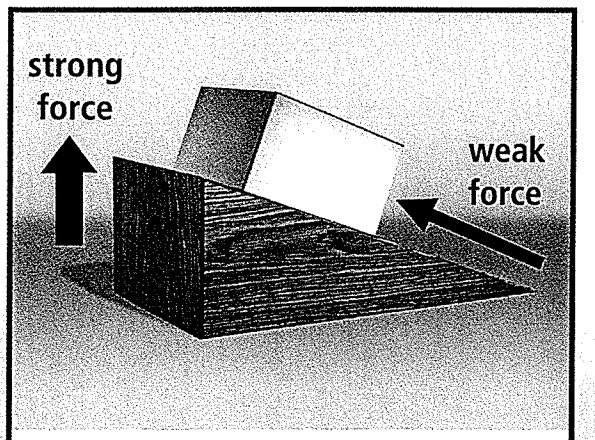


A pulley changes the direction of a force but not its strength.

The man pulls down on the rope of the pulley. In which direction does the birdfeeder move?

Inclined Plane

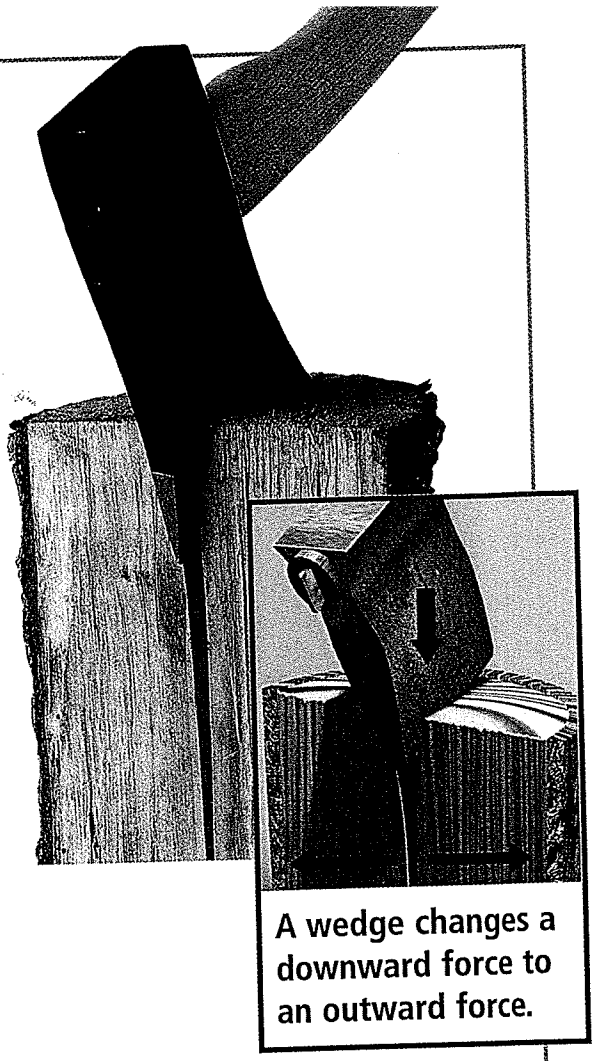
Movers often use a ramp to move heavy objects up to the level of a truck. A ramp is a type of simple machine called an inclined plane (ihn KLYND). An **inclined plane** is a simple machine made up of a slanted surface. Using an inclined plane makes it easier to move a heavy object to a higher position. Movers could use a stronger force to lift a heavy object straight up. By pushing the object up an inclined plane, they use a weaker force over a longer distance.



An inclined plane changes both the strength and the direction of a force.

Wedge

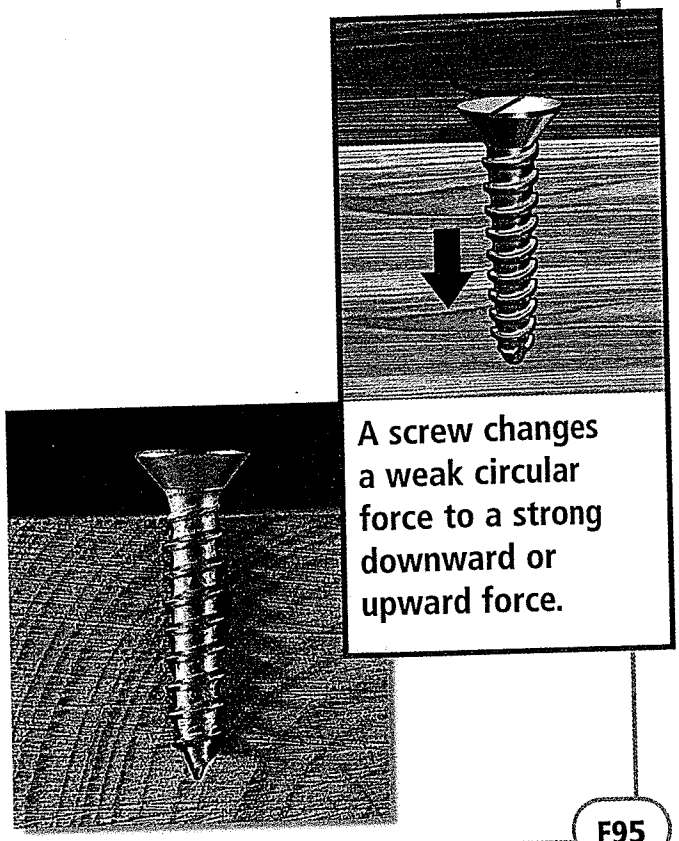
A **wedge** (wehj) is a simple machine made up of two inclined planes. Like the ax shown here, a wedge has a pointed end and a wide end. A wedge is used to cut or split objects. When you use a wedge, you apply a downward force to the wide end. The slanted sides change the downward force to sideward forces. This splits the object into two pieces.



A wedge changes a downward force to an outward force.

Screw

A **screw** (skroo) is a simple machine made up of an inclined plane wrapped around a column. Screws are used to attach boards and other objects. When you turn a screw, the inclined plane moves the column up or down. You apply a weak circular (SUR kyuh luhr) force to the screw. The screw changes the force to a strong downward or upward force. This makes it easy to move the screw into a hard material, such as a wooden board.



A screw changes a weak circular force to a strong downward or upward force.

CLASSIFY **What two simple machines are made up of one or more inclined planes?**

EXIT TICKET

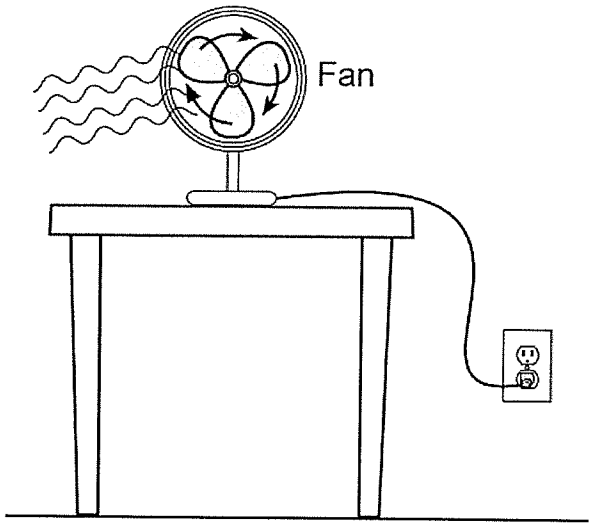
Name:_____ **Date:**_____
BCCSG **Howard / Spelman**

1. Which force produces heat as the tires of a school bus rub against the road?

   A electricity
   B friction
   C gravity
   D magnetism

2. Which material is the best conductor of electricity?
   A rubber
   B plastic
   C metal
   D glass

3. The diagram below shows a fan that uses energy to move the air in a room.



Which form of energy causes the blades of the fan to turn?
A chemical
B electrical
C heat
D light

Grade: