Lesson 3 | Forces

Inquiry **Launch Lab** **LESSON 3: 10 minutes**

What affects the way objects fall?

If you drop a piece of paper and a book, will they fall in the same way? Let's find out!

Procedure

1. Read and complete a lab safety form.
2. Rest a **sheet of paper** on one hand and a **book** on the other hand with your palms up. Drop both hands at the same time. Observe how the objects fall. Record your observations in the Data and Observations section below.
3. Wad an identical sheet of paper into a ball. Repeat step 2.
4. Place the flat sheet of paper on top of the book so that the edges are even. Drop them, and observe how they fall. Record your observations below.

Data and Observations

Think About This

1. **Compare** and **contrast** the speeds of the objects as they fell.

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2. **Key Concept** Why do you think the objects fell at the same or different speeds?

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Name ____________________ Date ____________ Class ________

Content Vocabulary

LESSON 3

Forces

Directions: *On each line, write the term from the word bank that correctly replaces the words in each sentence. NOTE: You may need to change a term to its plural form.*

air resistance	**contact force**	**force**
friction	**gravity**	**inertia**
Newton's first law of motion	**Newton's second law of motion**	
Newton's third law of motion	**noncontact force**	

____________ **1.** Gravity is a(n) force that acts on an object without touching it.

____________ **2.** Smooth surfaces have less of a contact force that resists the sliding motion of two surfaces that are touching than rough surfaces.

____________ **3.** If you jump off of a rock, you are pulled toward Earth because of an attractive force between you and Earth.

____________ **4.** Min and Samya are pushing carts in a parade, and they need to move at the same rate. According to the principle that the acceleration of an object is equal to the net force exerted on the object divided by the object's mass, Min will need to use more force than Samya because Min's cart has greater mass.

____________ **5.** When a car stops, safety belts help prevent a person from continuing to move forward due to the tendency of an object to resist a change in its motion.

____________ **6.** Surface area is one factor that determines the extent of the frictional force between air and objects moving through it.

____________ **7.** According to the principle that describes the existence of force pairs, a pile of books and the table upon which they are stacked exert equal and opposite forces on each other.

____________ **8.** Even small actions involve exerting pushes on an object.

____________ **9.** Almost all your daily activities involve pushes or pulls on one object by another object that is touching it.

____________ **10.** The law of inertia is another name for the principle that if the net force acting on an object is zero, then the motion of the object does not change.

Name ______________________ Date ______________ Class ________

Lesson Outline

Forces

A. What is force?

1. A(n) ______________ is a push or a pull on an object.

a. Force has size and ______________.

b. The unit for force is the ______________ (N).

2. A(n) ______________ force is a push or a pull on an object by another object that is touching it.

3. A(n) ______________ force pushes or pulls an object without touching it.

B. Gravity—A Noncontact Force

1. ______________ is a noncontact force that every object exerts on every other object because of its ______________.

2. Mass is the amount of ______________ in an object.

3. The size of a gravitational force between two objects depends on the ______________ of the objects and the ______________ between them.

4. ______________ is the gravitational force acting on an object's mass, so ______________ depends on the masses of the objects and the distance between them.

5. In the same place on Earth, an object with greater ______________ has a greater weight.

C. Friction—A Contact Force

1. ______________ is a contact force that resists the motion of two surfaces that are ______________.

2. ______________ surfaces usually produce more friction than smooth surfaces do.

3. The direction of the force of friction is in the ______________ the direction of the motion of the object.

4. ______________ is the frictional force between air and an object moving through it.

Lesson Outline continued

D. Combining Forces

1. When more than one force acts on an object, the forces combine and act as ______________ force.

2. The sum of all forces acting on an object is the ______________ force.

3. If the net force acting on an object is zero, the forces are said to be ______________.

4. If the net force acting on an object is not zero, the forces are said to be ______________.

E. Unbalanced Forces and Acceleration

1. Unbalanced forces can change the ______________ of the object or its ______________ of motion.

2. If unbalanced forces change the ______________ of an object, the object's ______________ also changes.

F. Balanced Forces and Constant Motion

1. When ______________ forces act on an object at rest, the object remains at rest.

2. When balanced forces act on an object in motion, the object moves at a constant ______________.

G. Forces and Newton's Laws of Motion

1. Newton's ______________ law of motion states that if forces acting on an object are ______________, the velocity of the object does not change.

a. Newton's first law is sometimes called the law of ______________.

b. Inertia is the tendency of an object to ______________ a change in its ______________.

2. Newton's ______________ law states that the acceleration of an object is ______________ to the net force exerted on the object divided by the object's ______________.

3. Newton's ______________ law says that for every action, there is an equal and opposite ______________.

Inquiry MiniLab

LESSON 3: 15 minutes

How do forces affect motion?

Procedure

1. Read and complete a lab safety form.
2. Use **masking tape** to attach one end of a **50-cm length of string** under the front end of a **mini-skateboard.** Attach the other end of the string to a **50-g mass.**
3. Place a **small ball of clay** on the skateboard.
4. Tape a **pencil** along the edge of a table. Hold the skateboard about 40 cm from the edge of the table. Extend the string over the pencil, and let the weight drop over the table's edge.
5. Let go of the skateboard. Observe what happens to the clay as the skateboard stops at the pencil. Record your observations in the Data and Observations section below.

Data and Observations

Analyze and Conclude

1. **Identify Cause and Effect** What caused the skateboard to start moving?

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2. **Explain** the action of the clay after the skateboard stopped moving.

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3. **Key Concept** Describe the motion of the skateboard and the clay in terms of balanced and unbalanced forces.

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Content Practice A

LESSON 3

Forces

Directions: *On each line, write the term or phrase from the word bank that correctly completes each sentence. Each term is used only once.*

air resistance	**contact force**
force	**friction**
gravity	**Newton's first law of motion**
Newton's second law of motion	**Newton's third law of motion**
noncontact force	

1. ______________________ says that for every action there is an equal and opposite reaction.

2. ______________________ is a push or a pull on an object.

3. ______________________ is a noncontact force that every object exerts on every other object because of its mass.

4. ______________________ states that the acceleration of an object decreases as an object's mass increases and increases as the net force acting on the object increases.

5. ______________________ is a push or a pull on one object by another object that is touching it.

6. ______________________ is a contact force that resists the motion of two surfaces that are touching.

7. ______________________ is a force that pushes or pulls an object without touching it.

8. ______________________ is the frictional force between air and objects moving through it.

9. ______________________ says if the forces on an object are balanced, the velocity of the object does not change.

Name ______________________ Date ______________ Class ________

Content Practice B

LESSON 3

Forces

Directions: *Complete the chart by identifying each force as a contact force or a noncontact force.*

Contact and Noncontact Forces	
Description	**Type of Force**
1. a mother's hand pushing a stroller	
2. a car crashing into a wall	
3. the force acting between two magnets	
4. gravity pulling a child to the ground as he jumps from a tree	
5. a foot kicking a ball through a goal post	
6. movers dragging a couch into a house	

Directions: *On the line before each statement, write* T *if the statement is true or* F *if the statement is false. If the statement is false, change the underlined word(s) to make it true. Write your changes on the lines provided.*

______ **7.** Force has size and <u>direction</u>. ______________________

______ **8.** The unit for force is the <u>meter (m)</u>. ______________________

______ **9.** Contact forces can be small <u>but not large</u>. ______________________

______ **10.** The size of a gravitational force <u>does not depend</u> on the masses of the objects or the distance between them. ______________________

______ **11.** As two objects move apart, the gravitational force between them <u>decreases</u>.
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______ **12.** Weight is the gravitational force acting on an object's <u>mass</u>.
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______ **13.** When comparing the weight of two objects at the same location on Earth, the object with <u>less</u> mass has a greater weight. ______________________

______ **14.** The weights of objects on the Moon are smaller than the same objects on Earth because the mass of the Moon is <u>smaller</u>. ______________________

Readers' Theater: Sports Day

SETTING: Sports Day practice on the athletic field

CHARACTERS: Curtis, Diego, Lin, Mika

Mika: Listen up, everyone! We need to make this practice count if we're going to be ready for Sports Day next week.

Lin: There are so many events. How will we ever be ready for all of them?

Curtis: We should remember what we learned in science class about forces. It will help us focus on what each event really involves.

Lin: Are you crazy? We can't waste time with science. This is a sports competition!

Diego: Curtis is right. These events depend on pushing and pulling, and that fits with what Mr. James taught us about forces.

Mika: Maybe you're right. I remember when Mr. James said, "A push or a pull on an object is called a force."

Curtis: And remember that a force has size and direction, so when we work together we have to think about the direction and the amount of force we are using.

Lin: The first event is the archery competition. Where is the force in that event?

Mika: Well, think about the types of forces Mr. James described. I think your hand pulling back on the bowstring is a contact force. It's the force one object applies to another object when they're touching.

Lin: You're right, and we need a person who can exert lots of force for this one, because the targets are far out in the field. What is the unit of measure for force?

Diego: It is the newton. It's named after Isaac Newton, the scientist from the 1600s, remember? Do you remember Newton's laws? Anyway, a force of 1 N is pretty small, like lifting a pencil, so we need someone who can lift with a lot of newtons!

Mika: You're funny, Diego, but we really need to get serious. What forces do we need to think about for the high jump?

Curtis: With the high jump, we need to think about a noncontact force such as gravity. Remember that noncontact forces don't have to be touching to apply force on each other. When you jump up to clear the bar on the high jump, gravity applies a force to pull you back to Earth, even though you're not touching Earth.

Lin: But your gravitational force pulls on Earth too, right?

Diego: Right. But Earth's mass is so huge compared to ours that we notice the pull of Earth's gravity on us more than we notice our pull on Earth.

Reader's Theater continued

Mika: Okay, focus, everyone! What about events like tug-of-war and the log pull? Those events require more than just one person applying force.

Lin: I think winning the tug-of-war depends on unbalanced forces. Since we'll have two forces pulling in opposite directions, we need to make the force we apply greater than the force the other team exerts.

Diego: Right! If we have a force of 250 N pulling our way and the other team has a force of 125 N pulling their way, the rope will go our way because we have the greater force.

Curtis: Here's where those laws come in. Remember Newton's first law of motion? It says that if the net force on an object is balanced, or zero, then the object's motion doesn't change. So, unless we have more newtons of force than they do, the flag on the rope will just stay on the middle line.

Lin: I'm beginning to get the hang of this. If I'm pulling with a force of 75 N in the log pull, and Curtis pulls along with me with a force of 100 N, then our combined force in the same direction will be 175 N. If the other teams aren't pulling with that much force, we'll win!

Diego: According to Newton, that log has inertia, which means it has a resistance to a change in motion. And since it's harder to change the motion of an object that has more mass, it's going to take a lot of force to get it moving.

Mika: And we should try to keep it moving on flat, smooth ground because rough surfaces produce more friction than smooth surfaces.

Curtis: What is friction again?

Lin: I remember! Friction is a contact force that resists the sliding motion of two surfaces that are touching. You guys were right. Success in Sports Day depends on what we learned about forces!

School to Home **LESSON 3**

Forces

For this activity, you will need two identical pieces of paper.

1. Crumple one piece of paper into a small ball. Keep the other piece of paper flat. How does the amount of surface area of the pieces of paper compare?

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2. **Predict** how the size of the surface area will affect the air resistance acting on each sheet of paper.

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3. Hold the ball of paper in one hand and the flat piece of paper in the other. Be sure both are the same distance from the floor. Drop both pieces of paper at the same time. **Describe** what you observe.

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4. How did the size of the paper's surface area affect the amount of air resistance acting on the paper? Was your prediction correct?

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5. How can you be sure that a difference in the amount of gravity pulling the papers toward Earth was not the cause of the difference in the papers' motion? Use the words *mass* and *distance* in your response.

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Name ______________________ Date ____________ Class ______

Key Concept Builder **LESSON 3**

Forces

Key Concept What are different types of forces?

Directions: *Answer each question or respond to each statement on the lines provided.*

1. What is a force?

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2. What is the unit for force?

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3. What is the difference between a contact force and a noncontact force?

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4. List two examples of contact forces. ______________________________

5. List two examples of noncontact forces. ______________________________

6. **Describe** the relationship between gravitational force and mass.

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7. **Describe** the relationship between gravitational force and distance.

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8. How are mass and weight different?

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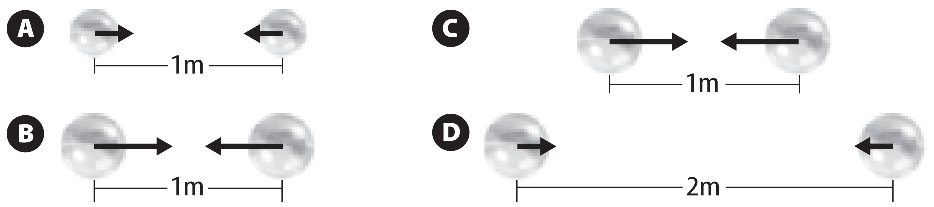
Name ______________________ Date ______________ Class ________

Key Concept Builder

Forces

Key Concept What factors affect the force of gravity?

Directions: *Use the diagram to answer each question by writing the letter of the correct answer on the line before each statement. (Hint: The diagram shows how mass and distance affect gravitational force.)*



_______ **1.** Which pair of marbles has a greater force of attraction between them?
- **A.** Figure A
- **B.** Figure B
- **C.** Figure D

_______ **2.** Which statement best describes the force of attraction between the marbles in Figure A and the marbles in Figure B?
- **A.** The force of attraction does not depend on the mass of the marbles.
- **B.** The Figure A marbles have a greater force of attraction because they have smaller mass.
- **C.** The Figure B marbles have a greater force of attraction because they have more mass.

_______ **3.** The mass of the marbles in Figures C and D are the same. Which pair of marbles has a greater force of attraction between them?
- **A.** equal
- **B.** Figure C
- **C.** Figure D

_______ **4.** Which statement best describes the force of attraction between the marbles in Figure C and the marbles in Figure D?
- **A.** The force of attraction does not depend on the distance between the marbles.
- **B.** The force of attraction between the marbles in D is less than C because the distance between the marbles is greater.
- **C.** The force of attraction between the marbles in D is more than C because the distance between the marbles is greater.

Key Concept Builder

LESSON 3

Forces

Key Concept What happens when forces combine?

Directions: *Complete the chart by figuring the net force and writing your answer in the correct column. Then put a check mark in the correct column to indicate whether the force is balanced or unbalanced. Finally, decide the direction of acceleration and write* right, left, *or* does not move *in the last column. (Hint: All positive forces move to the right. All negative forces move to the left.)*

Forces	Net Force	Balanced Forces	Unbalanced Forces	Direction of Acceleration
1. 100 N + −50 N	50 N		√	right
2. 60 N + −60 N				
3. 750 N + −650 N				
4. 105 N + −225 N				
5. 2 N + −2 N				
6. 37 N + −62 N				
7. 1800 N + −1799 N				
8. 900 N + −1505 N				
9. 45 N + −45 N				
10. 17 N + −25 N				
11. 1 N + −2 N				
12. 1500 N + −1600 N				
13. 25 N + −15 N				

Key Concept Builder **LESSON 3**

Forces

Key Concept How are balanced and unbalanced forces related to motion?

Directions: *On the line before each statement, write the letter of the term that matches it correctly. Some terms may be used more than once.*

_______ **1.** For every action there is an equal and opposite reaction.

_______ **2.** The acceleration of an object decreases as an object's mass increases and increases as the net force acting on the object increases.

_______ **3.** If the forces on an object are balanced, then the velocity of the object does not change.

_______ **4.** Acceleration (a) = force (f)/mass (m).

_______ **5.** When one object exerts a force on another object, the second object exerts a force of equal size in the opposite direction on the first object.

_______ **6.** This is sometimes called the law of inertia.

_______ **7.** A force of 100 N is needed to cause a mass of 6 kg to accelerate to 30 m/s. If you want to accelerate a mass of 12 kg at the same rate, you would need a force of 200 N.

_______ **8.** Force pairs are equal and opposite forces.

_______ **9.** When a car crashes into a wall, unbalanced forces act on the car and it stops. Test dummies, which are not attached to the car, continue to move with a constant velocity because of their inertia.

A. Newton's First Law of Motion

B. Newton's Second Law of Motion

C. Newton's Third Law of Motion

Who "invented" inertia?

The law of inertia is another name for Newton's first law of motion. However, Newton wasn't the first scientist to explain the tendency of an object to resist changes in velocity. Newton built on the ideas of Galileo Galilei.

Early Beliefs

Before the time of Galileo, many people believed that you had to keep pushing something to keep it moving. They based their belief on experience. When you push a chair across a room, you have to keep pushing to keep the chair moving at the same velocity. If you stop pushing, the chair stops moving.

Galileo believed that when the push on the chair is removed, the chair should continue to move without any further force because the energy you gave the chair isn't used up. He said that what made the chair stop was another force acting on it—friction. Friction between the chair and the floor continues to resist the motion of the chair after you stop pushing. This causes the energy that you gave the chair by pushing it to transfer from the chair to the floor. When all the energy has transferred to the floor, the chair stops moving.

Galileo's Thought Experiment

Galileo based his ideas on a thought experiment. There is no such thing as a frictionless surface, but Galileo made one up in his head. He imagined a ball rolling on a frictionless U-shaped track. If you release the ball at the top of one side of the U, it rolls down the track and back up the other side. Because there is no friction to slow it down, it will roll up to the same height from which it started.

Galileo then imagined starting the ball in the same way, but lowering the other end of the track a bit. The lowered side had to be longer so the ball eventually could reach the same height that it started from.

Galileo kept mentally lowering one end of the track, making that end longer and longer so the ball could always reach the same height. Finally, Galileo lowered the end of the track to the horizontal. The ball rolled down the side of the track onto the level part and kept going forever because it could never get back up to the same height. The ball would continue moving in a straight line and at a constant speed because no outside force acted on it. This was the idea of inertia.

Galileo's law of inertia was very similar to Newton's. A body will continue in its state of rest or motion unless acted on by an unbalanced, outside force. Although Galileo had the idea, he could never work out the mathematics. That was Newton's contribution to the law of inertia.

Applying Critical-Thinking Skills

Directions: *Answer each question.*

1. **Infer** To keep a car moving at a constant speed, how much energy must the engine give the wheels? Why?
2. **Evaluate** Is a thought experiment as useful as a real experiment? Why or why not?

Challenge **LESSON 3**

Using Newton's Second Law of Motion

Newton was the first person to recognize that an unbalanced force always produces acceleration, not just motion. For example, if the force acts on an object at rest, the object accelerates from rest to some velocity. If the force acts in the same direction an object is moving, the object increases its speed. If the force acts in the opposite direction of motion, the object decreases its speed. If the object acts at some angle to the motion, the object changes direction. Keep in mind that acceleration is a change in velocity, which can occur with a change in speed or direction.

Newton states the relationship among force, mass, and acceleration in the formula $F = ma$, where F is force, m is mass, and a is acceleration. The terms in the formula can be rearranged to solve for any one of the terms if the other two are known: $a = \frac{F}{m}$ and $m = \frac{F}{a}$.

Solve Problems Using *F* = *ma*

Use the formulas to solve the following problems. First, write down the given terms. Then decide which formula to use, plug in the values, and do the math. Watch your units. Keep in mind that 1 Newton = 1 $kg \cdot m/s^2$.

1. An unbalanced force of 25 N to the right is applied to a 12.5 kg mass. What is the acceleration of the mass?

2. What force is needed to accelerate a stone with a mass of 5 kg to a velocity of 4.0 m/s^2?

3. An unbalanced force of 300 N gives a go-cart an acceleration of 2 m/s^2. What is the mass of the cart?

Name ______________________________ Date ______________ Class ________

Inquiry **Lab A** **90 minutes**

Design a Safe Vehicle

Think about all you have learned about balanced and unbalanced forces in this chapter. Suppose you have the job of making passenger cars safer for passengers. How are these forces important in protecting passengers during a collision? In this lab, you will design an experiment that demonstrates how forces can protect a passenger during a collision.

Ask a Question

How can you protect a passenger in a car crash?

Materials

board	balloons	string	colored ribbons
clay	masking tape	stopwatch	foam block

Also needed: rubber bands

Safety

Make Observations

- ❑ **1.** Read and complete a lab safety form.
- ❑ **2.** Decide which vehicle your group will use. You may use one provided by your teacher, or you may use another one, approved by your teacher, that has a similar size.
- ❑ **3.** Your vehicle must travel about 2 m with an average speed at least 0.75 m/s and then stop suddenly.
  - ❑ What force will move your vehicle?

    ____
  - ❑ How will you stop the vehicle?

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    ____
- ❑ **4.** Place the clay passenger on your vehicle.
  - ❑ Use the force you choose to move the vehicle on the track and stop it.
  - ❑ Observe what happens to the passenger.
- ❑ **5.** Try different ways to protect the passenger. You may use materials provided or others approved by your teacher.

Lab A continued

Form a Hypothesis

❑ **6.** Based on your observations, formulate a hypothesis about how you can use forces to protect the passenger. Recall that a hypothesis is an explanation of an observation that can be tested.

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Test Your Hypothesis

❑ **7.** Test the method you have prepared for protecting the clay passenger as the vehicle moves along the track and stops.

❑ **8.** Time the motion of the vehicle, and calculate its average speed. Show that its average speed was at least 0.75 m/s.

❑ Record your observations of the time and distance.

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❑ Record your observations of what happens to the clay passenger during the test.

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❑ **9.** If your passenger moves significantly or is damaged during the test, modify your method of protecting it. Record any changes you make.

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❑ Then, test the changes and record your observations.

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Lab Tips

- If you use a restraint similar to safety belts, be sure to design them so that they don't harm the clay figure.
- Consider forces, including gravity and friction, when planning your experiment.

Lab A continued

Analyze and Conclude

❑ **10. Describe** how you protected the passenger as the vehicle moved and stopped.

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❑ **11. The Big Idea** Describe the forces that affected the motion of the vehicle and the clay passenger.

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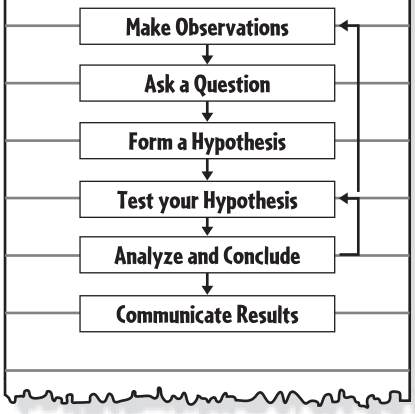
Communicate Your Results

Describe your demonstration to the class. Evaluate the effectiveness of the method you used to protect your passenger. Explain how forces were important.

Remember to use scientific methods.



Name ______________________ Date ______________ Class ________

Inquiry **Lab B** **90 minutes**

Design a Safe Vehicle

Think about all you have learned about balanced and unbalanced forces in this chapter. Suppose you have the job of making passenger cars safer for passengers. How are these forces important in protecting passengers during a collision? In this lab, you will design an experiment that demonstrates how forces can protect a passenger during a collision.

Ask a Question

How can you protect a passenger in a car crash?

Materials

board

clay

balloons

masking tape

string

stopwatch

colored ribbons

foam block

Also needed: rubber bands

Safety

Make Observations

1. Read and complete a lab safety form.
2. Decide which vehicle your group will use. You may use one provided by your teacher, or you may use another one, approved by your teacher, that has a similar size.
3. Your vehicle must travel about 2 m with an average speed at least 0.75 m/s and then stop suddenly. What force will move your vehicle? How will you stop the vehicle?

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4. Place the clay passenger on your vehicle. Use the force you choose to move the vehicle on the track and stop it. Observe what happens to the passenger.
5. Try different ways to protect the passenger. You may use materials provided or others approved by your teacher.

Lab B continued

Form a Hypothesis

6. Based on your observations, formulate a hypothesis about how you can use forces to protect the passenger. Recall that a hypothesis is an explanation of an observation that can be tested.

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Test Your Hypothesis

7. Test the method you have prepared for protecting the clay passenger as the vehicle moves along the track and stops.

8. Time the motion of the vehicle, and calculate its average speed. Show that its average speed was at least 0.75 m/s. Record observations of the time and distance below. Also record your observations of what happens to the clay passenger during the test.

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9. If your passenger moves significantly or is damaged during the test, modify your method of protecting it. Record any changes you make. Then, test the changes and record your observations.

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Lab Tips

- If you use a restraint similar to safety belts, be sure to design them so that they don't harm the clay figure.
- Consider forces, including gravity and friction, when planning your experiment.

Name ______________________ Date ______________ Class __________

Lab B continued

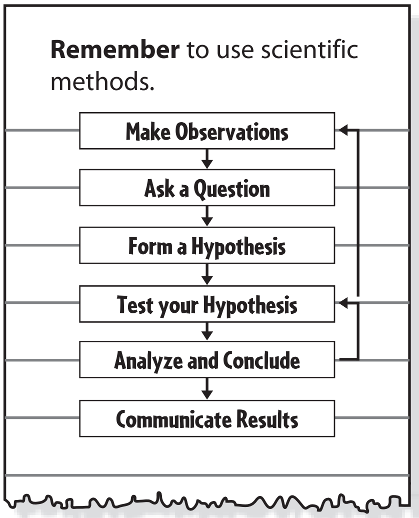
Analyze and Conclude

10. Describe how you protected the passenger as the vehicle moved and stopped.

11. The Big Idea Describe the forces that affected the motion of the vehicle and the clay passenger.

Communicate Your Results

Describe your demonstration to the class. Evaluate the effectiveness of the method you used to protect your passenger. Explain how forces were important.



Inquiry Extension

Develop a method for protecting a raw egg in a plastic bag that is dropped from a height of 1 m. Think about how you could reduce the speed of the fall and how you could decrease the force on the egg when it hits the ground.

Name ______________________ Date ______________ Class __________

Inquiry **Lab C**

Investigating Forces of Gravity and Friction

Directions: *Use the information and data from the Lab* Design a Safe Vehicle *to perform this lab.*

You have learned that forces can be unbalanced or balanced, and in Lab B you considered the forces that act on a vehicle when you designed a safe vehicle. Use your vehicle from Lab B to design a procedure that investigates the forces of gravity and friction. Tie a length of string to your car and hang the string over the edge of your lab table. Attach a paper clip to the other end of the string. Draw a diagram of this setup and add the forces and counterforces acting on the car with arrows and labels. Use this setup and other materials approved by your teacher to answer one or more of the following questions:

- When a force applied to an object increases, does the object move at a constant rate of speed or does it accelerate?
- Which forces act as counterforces to gravity?
- How can you demonstrate the equation $F = ma$?

Please note that you must complete Lab B before beginning Lab C. Also, have your teacher approve your design and safety procedures before beginning your experiment.

Chapter Key Concepts Builder

Motion and Forces

End-of-Chapter Practice

Directions: *Work with a small group to create a poster display that describes the motion of an object. To complete this activity you will have to do the following:*

With your group, identify the object, the unit of distance, and the unit of time. Next, create a data chart with at least ten data points.

Time	Distance	Speed

Divide your group in two. Have half the group create a distance-time graph based on the data chart and have the second half create a speed-time graph based on the data chart. Compare and contrast the graphs taking the following into consideration:

What information were you able to find on each of the graphs?	What information were you unable to find on each of the graphs?
Describe the motion of the object on each graph:	
Is the object speeding up? Is it slowing down? Does it change speed?	Is it ever at rest? Does it move at a constant speed?

Finally, create your poster and present your findings to the class.

Display requirements:

- well-organized and informative
- clear graphs
- equal participation