AIMS Multimedia is a leading producer and distributor of educational programs serving schools and libraries for nearly 40 years. AIMS draws upon the most up-to-date knowledge, existing and emerging technologies, and all of the instructional and pedagogical resources available to develop and distribute educational programs in film, videocassette, laserdisc, CD-ROM and CD-i formats.

Persons or schools interested in obtaining additional copies of this AIMS Teaching Module, please contact:

AIMS Multimedia

1-800-FOR-AIMS
1-800-367-2467
Congratulations!

You have chosen a learning program that will actively motivate your students AND provide you with easily accessible and easily manageable instructional guidelines designed to make your teaching role efficient and rewarding.

The AIMS Teaching Module provides you with a video program keyed to your classroom curriculum, instructions and guidelines for use, plus a comprehensive teaching program containing a wide range of activities and ideas for interaction between all content areas. Our authors, educators, and consultants have written and reviewed the AIMS Teaching Modules to align with the Educate America Act: Goals 2000.

This ATM, with its clear definition of manageability, both in the classroom and beyond, allows you to tailor specific activities to meet all of your classroom needs.
RATIONALE

In today’s classrooms, educational pedagogy is often founded on Benjamin S. Bloom’s “Six Levels of Cognitive Complexity.” The practical application of Bloom’s Taxonomy is to evaluate students’ thinking skills on these levels, from the simple to the complex: Knowledge (rote memory skills), Comprehension (the ability to relate or retell), Application (the ability to apply knowledge outside its origin), Analysis (relating and differentiating parts of a whole), Synthesis (relating parts to a whole), and Evaluation (making a judgment or formulating an opinion).

The AIMS Teaching Module is designed to facilitate these intellectual capabilities, AND to integrate classroom experiences and assimilation of learning with the students’ life experiences, realities, and expectations. AIMS’ learner verification studies prove that our AIMS Teaching Modules help students to absorb, retain, and to demonstrate ability to use new knowledge in their world. Our educational materials are written and designed for today’s classroom, which incorporates a wide range of intellectual, cultural, physical, and emotional diversities.
ORGANIZATION AND MANAGEMENT

To facilitate ease in classroom manage-
ability, the AIMS Teaching Module is
organized in four sections. You are
reading Section 1, Introduction to the
Aims Teaching Module (ATM).

SECTION 2,
INTRODUCING THIS ATM
will give you the specific information
you need to integrate the program into
your classroom curriculum.

SECTION 3,
PREPARATION FOR VIEWING
provides suggestions and strategies for
motivation, language preparedness,
readiness, and focus prior to viewing
the program with your students.

SECTION 4,
AFTER VIEWING THE PROGRAM
provides suggestions for additional
activities plus an assortment of consum-
able assessment and extended activities,
designed to broaden comprehension of
the topic and to make connections to
other curriculum content areas.
FEATURES

INTRODUCING EACH ATM

SECTION 2

Your AIMS Teaching Module is designed to accompany a video program written and produced by some of the world’s most credible and creative writers and producers of educational programming. To facilitate diversity and flexibility in your classroom, your AIMS Teaching Module features these components:

Themes

The Major Theme tells how this AIMS Teaching Module is keyed into the curriculum. Related Themes offer suggestions for interaction with other curriculum content areas, enabling teachers to use the teaching module to incorporate the topic into a variety of learning areas.

Overview

The Overview provides a synopsis of content covered in the video program. Its purpose is to give you a summary of the subject matter and to enhance your introductory preparation.

Objectives

The ATM learning objectives provide guidelines for teachers to assess what learners can be expected to gain from each program. After completion of the AIMS Teaching Module, your students will be able to demonstrate dynamic and applied comprehension of the topic.
PREPARATION FOR VIEWING

SECTION 3
In preparation for viewing the video program, the AIMS Teaching Module offers activity and/or discussion ideas that you may use in any order or combination.

Introduction To The Program
Introduction to the Program is designed to enable students to recall or relate prior knowledge about the topic and to prepare them for what they are about to learn.

Introduction To Vocabulary
Introduction to Vocabulary is a review of language used in the program: words, phrases, usage. This vocabulary introduction is designed to ensure that all learners, including limited English proficiency learners, will have full understanding of the language usage in the content of the program.

Discussion Ideas
Discussion Ideas are designed to help you assess students’ prior knowledge about the topic and to give students a preview of what they will learn. Active discussion stimulates interest in a subject and can motivate even the most reluctant learner. Listening, as well as speaking, is active participation. Encourage your students to participate at the rate they feel comfortable. Model sharing personal experiences when applicable, and model listening to students’ ideas and opinions.

Focus
Help learners set a purpose for watching the program with Focus, designed to give students a focal point for comprehension continuity.

Jump Right In
Jump Right In provides abbreviated instructions for quick management of the program.

AFTER VIEWING THE PROGRAM

SECTION 4
After your students have viewed the program, you may introduce any or all of these activities to interact with other curriculum content areas, provide reinforcement, assess comprehension skills, or provide hands-on and in-depth extended study of the topic.
SUGGESTED ACTIVITIES

The Suggested Activities offer ideas for activities you can direct in the classroom or have your students complete independently, in pairs, or in small work groups after they have viewed the program. To accommodate your range of classroom needs, the activities are organized into skills categories. Their labels will tell you how to identify each activity and help you correlate it into your classroom curriculum. To help you schedule your classroom lesson time, the AIMS hourglass gives you an estimate of the time each activity should require. Some of the activities fall into these categories:

Meeting Individual Needs

These activities are designed to aid in classroom continuity. Reluctant learners and learners acquiring English will benefit from these activities geared to enhance comprehension of language in order to fully grasp content meaning.

Curriculum Connections

Many of the suggested activities are intended to integrate the content of the ATM program into other content areas of the classroom curriculum. These cross-connections turn the classroom teaching experience into a whole learning experience.

Critical Thinking

Critical Thinking activities are designed to stimulate learners’ own opinions and ideas. These activities require students to use the thinking process to discern fact from opinion, consider their own problems and formulate possible solutions, draw conclusions, discuss cause and effect, or combine what they already know with what they have learned to make inferences.

Cultural Diversity

Each AIMS Teaching Module has an activity called Cultural Awareness, Cultural Diversity, or Cultural Exchange that encourages students to share their backgrounds, cultures, heritage, or knowledge of other countries, customs, and language.

Hands On

These are experimental or tactile activities that relate directly to the material taught in the program. Your students will have opportunities to make discoveries and formulate ideas on their own, based on what they learn in this unit.

Writing

Every AIMS Teaching Module will contain an activity designed for students to use the writing process to express their ideas about what they have learned. The writing activity may also help them to make the connection between what they are learning in this unit and how it applies to other content areas.

In The Newsroom

Each AIMS Teaching Module contains a newsroom activity designed to help students make the relationship between what they learn in the classroom and how it applies in their world. The purpose of In The Newsroom is to actively involve each class member in a whole learning experience. Each student will have an opportunity to perform all of the tasks involved in production: writing, researching, producing, directing, and interviewing as they create their own classroom news program.

Extended Activities

These activities provide opportunities for students to work separately or together to conduct further research, explore answers to their own questions, or apply what they have learned to other media or content areas.

Link to the World

These activities offer ideas for connecting learners’ classroom activities to their community and the rest of the world.

Culminating Activity

To wrap up the unit, AIMS Teaching Modules offer suggestions for ways to reinforce what students have learned and how they can use their new knowledge to enhance their world view.
VOCABULARY

Every ATM contains an activity that reinforces the meaning and usage of the vocabulary words introduced in the program content. Students will either read or find the definition of each vocabulary word, then use the word in a written sentence.

CHECKING COMPREHENSION

Checking Comprehension is designed to help you evaluate how well your students understand, retain, and recall the information presented in the AIMS Teaching Module. Depending on your students’ needs, you may direct this activity to the whole group yourself, or you may want to have students work on the activity page independently, in pairs, or in small groups. Students can verify their written answers through discussion or by viewing the video a second time. If you choose, you can reproduce the answers from your Answer Key or write the answer choices in a Word Bank for students to use. Students can use this completed activity as a study guide to prepare for the test.

CONSUMABLE ACTIVITIES

The AIMS Teaching Module provides a selection of consumable activities, designed to specifically reinforce the content of this learning unit. Whenever applicable, they are arranged in order from low to high difficulty level, to allow a seamless facilitation of the learning process. You may choose to have students take these activities home or to work on them in the classroom independently, in pairs or in small groups.

CHECKING VOCABULARY

The Checking Vocabulary activity provides the opportunity for students to assess their knowledge of new vocabulary with this word game or puzzle. The format of this vocabulary activity allows students to use the related words and phrases in a different context.

TEST

The AIMS Teaching Module Test permits you to assess students’ understanding of what they have learned. The test is formatted in one of several standard test formats to give your students a range of experiences in test-taking techniques. Be sure to read, or remind students to read, the directions carefully and to read each answer choice before making a selection. Use the Answer Key to check their answers.
ADDITIONAL AIMSMULTIMEDIA
PROGRAMS

After you have completed this AIMS Teaching Module you may be interested in more of the programs that AIMS offers. This list includes several related AIMS programs.

ADDITIONAL READING SUGGESTIONS

AIMS offers a carefully researched list of other resources that you and your students may find rewarding.

ANSWER KEY

Reproduces tests and work pages with answers marked.
**Newton's Laws of Motion:**

**THEMES**

The major theme of this program is the explanation, through demonstration, of Newton's laws of mass, force and motion. Related themes are the force of friction, the differences between mass and weight, and a description of balanced and unbalanced forces.

**OVERVIEW**

In Mr. Dexter's classroom, students are prepared to see a magic show. The magic which Mr. Dexter explains is the physical laws discovered by Isaac Newton. Using a soccer ball and a beach ball, along with weights, he explains the difference between the mass of an object and its weight. A stationary boot suspended from the ceiling by a string shows the balanced forces of gravity and upward pull, and illustrates part of Newton's first law, "An object at rest remains at rest unless acted on by an unbalanced force." Cutting the string unbalances the forces, and the boot drops. In Newtonian terms, this explains that "an object in motion will remain in motion in a straight line at constant speed unless acted on by an unbalanced force." When the boot hits the floor, the downward force of gravity is stopped by the floor and the boot is at rest. When the boot is kicked across the floor, students correctly state that friction has stopped the motion of the boot.

Mr. Dexter explains velocity and momentum by sending a toy truck and a toy car down an incline. The truck travels faster and further than the car because it has more mass, thus more momentum.

Students then perform experiments of their own to illustrate the laws of force, mass, and momentum. In one experiment, Mr. Dexter tries to knock down bowling pins with a balloon, a soccer ball, and a bowling bowl. Only the bowling bowl has the mass and momentum to scatter the pins.

Another experiment requires Mr. Dexter's car, an object with a great deal of mass. When Mr. Dexter applies the brakes, friction causes the car to stop. When one student tries to push the car at rest, it barely moves. Two students can produce more movement, but all four students can push the car ahead with more speed. This is a graphic representation of Newton's second law, "the more force applied, the greater the change of momentum."

A roller skating session demonstrates how friction, applied by the toe stop of a skate, makes the skater stop. When two students on skates push against each other, each skater is moved backward, showing that when one body exerts a force on another, the second exerts an equal, but opposite force. When all four students push against Mr. Dexter, he rolls backwards quickly, while the students move slower. Thus, objects with less mass have a greater change in velocity than objects with more mass. Finally, the students illustrate momentum and velocity with a game of baseball.

**OBJECTIVES**

- To explain and illustrate Newton's laws of mass, force and motion
- To demonstrate the difference between mass and weight
- To describe balanced and unbalanced forces, and the force of friction
- To give examples of experiments which illustrate Newton's laws
- To encourage students to perform their own demonstrations of these laws
INTRODUCTION TO THE PROGRAM

Bring in an inflated balloon and a medium sized pebble. Allow a few students to hold these and estimate their weight. Ask for guesses as to what would happen if you dropped these objects to the floor at the same time and from the same height. Accept all answers, then drop both the balloon and the pebble to the floor. Ask students to describe what has happened. Most likely, the pebble dropped straight down to the floor, while the balloon may have drifted in the air before reaching the floor. Ask if anyone can explain why this happened, and tell students that they will find out the answer in the video.

INTRODUCTION TO VOCABULARY

To prepare students for viewing Newton's Laws of Motion, ask for a definition of the word "law." Students will probably suggest a definition for "law" in the legal sense. That is, a rule established by some authority, with penalties for not following the rule. Indicate that the word also applies to mathematics, where it means a formula that describes a relationship between objects, numbers, or other phenomena. Newton's laws are ways of describing the relationship of mass, force and motion, and they hold true for all objects, from balloons, to cars, to planets.

DISCUSSION IDEAS

Without using these scientific terms, initiate a discussion about mass and velocity. Ask students to think about the design of race cars and the design of large transport trucks. Which is smaller and lighter? Which goes faster? How does the sleek, aerodynamic design of a race car allow it to move faster than a truck? Have students give examples of other instances in which smaller (less mass) translates to faster (more velocity). These might include the fact that one can throw a baseball faster and further than a bowling ball, hummingbirds fly faster than eagles, a large, heavy person would probably lose a foot race to a smaller, lighter runner. Explain that there are mathematical laws which explain this relationship.

FOCUS

To help students understand that mathematical laws are not just abstract ideas, suggest that they try to think of activities in their own lives which illustrate the laws of mass, motion and force.
JUMP RIGHT IN

**Preparation**

- Read *Newton’s Laws of Motion: Demonstration of Mass, Force, and Momentum* Themes, Overview, and Objectives to become familiar with program content and expectations.

- Use Preparation for Viewing suggestions to introduce the topic to students.

**Viewing** *NEWTON’S LAWS OF MOTION: DEMONSTRATION OF MASS, FORCE, AND MOMENTUM*

- Set up viewing monitor so that all students have a clear view.

- Depending on your classroom size and learning range, you may choose to have students view *Newton’s Laws of Motion: Demonstration of Mass, Force, and Momentum* together or in small groups.

- Some students may benefit from viewing the video more than one time.

**After Viewing** *NEWTON’S LAWS OF MOTION: DEMONSTRATION OF MASS, FORCE, AND MOMENTUM*

- Select Suggested Activities that integrate into your classroom curriculum. If applicable, gather materials or resources.

- Choose the best way for students to work on each activity. Some activities work best for the whole group. Other activities are designed for students to work independently, in pairs, or in small groups. Whenever possible, encourage students to share their work with the rest of the group.

- Duplicate the appropriate number of Vocabulary, Checking Comprehension, and consumable activity pages for your students.

- You may choose to have students take consumable activities home, or complete them in the classroom, independently, or in groups.

- Administer the Test to assess students’ comprehension of what they have learned, and to provide them with practice in test-taking procedures.

- Use the Culminating Activity as a forum for students to display, summarize, extend, or share what they have learned with each other, the rest of the school, or a local community organization.
SUGGESTED ACTIVITIES

Meeting Individual Needs

Ask students to restate Newton’s laws as defined in the video. The first law of motion is that an object at rest tends to stay at rest, and an object in motion tends to stay in motion in a straight line at a constant speed. The second law can be stated: the more force that is applied to an object, the more the object accelerates, but the more mass there is in an object, the more it resists acceleration. The third law says that for every action there is an equal and opposite reaction. Ask for illustrations of these laws. The first can be illustrated by a bowling ball on the floor (at rest) and a bowling ball thrown down the alley (in motion in a straight line at constant speed until it hits an unbalanced force - the pins). The second law can be illustrated by pushing a light door and a heavy door with the same force (the light door will swing open faster and further; the heavy door will take more force to move). A rocket launch is a good example of the third law - the rocket pushes down on the exhaust gasses, which push back and lift the rocket.

Hands On

Have two students measure the videotape of this program, and the plastic box it came in. The box is approximately 7-3/4 by 4-3/4 inches. The video is approximately 7-1/2 by 4 inches. Then have two other students weigh both the video and the box. The box weighs about 4 ounces and the video weighs about 6 ounces. Though both the video and the box are approximately the same size, the video weighs more. Ask why this is (the video has more mass). On the board, write the definition of mass (the amount of matter in an object). Ask for other examples of similar sized objects with different masses, such as a box made of paper and the same sized box made of metal, or an aluminum bat vs. a wooden bat. The “Introduction to the Program” activity is an example of increased mass producing increased velocity.

Connection to History

Sir Isaac Newton was a hero in the world of science, and a giant in a time of famous scientists. Separate the class into five small groups. Have one group research the life and work of Newton. Three other groups should research three great contemporaries of Newton—Christopher Wren, Edmund Haley (discoverer of the comet which bears his name) and Robert Hooke (with whom Newton had many disputes). The fifth group should research Europe in the time of Newton, including why England had eclipsed Italy to become a center of learning, how the Church of England was more conducive to independent thinking than the Roman Catholic church, and what effects the Great Plague had on Europe. All groups should report on their research, with the intent of giving the class an overview of life and science in the 1600’s.
**Connection to Science**

Ask for a definition of the word “friction” (force that slows or stops the movement of objects that are in contact with each other). Ask for examples of friction from the video (roller skate toe stop, boot sliding along the floor, car stopping). Ask if students can suggest other examples. Now ask students to think about what would happen if there was no friction. Would the boot have slid on the floor forever? Would the car ever stop? Lead this discussion into the next activity.

**Writing**

Give students the essay topic, A World without Friction. Explain that they should write a humorous essay on a world in which there is no friction. Encourage students to think creatively, disregarding logic or scientific reality. Students should also try to come up with a scientific law that explains this, such as “two objects in contact with each other will pass by each other without slowing or stopping.”

**Connection to Science**

Ask students to rub their hands together. This action creates friction. Then ask if their hands are getting warmer (yes). What, then, is happening when friction is created? Lead the class to the understanding that friction creates heat. How does this explain that rubbing two sticks together produces fire?

**Meeting Individual Needs**

Have students write down the activities in their lives which illustrate one or more of Newton’s laws. These might include sports (baseball, soccer, bowling, wrestling, roller skating), hobbies (car races, wrestling, motorcycle races), and even raking the yard (falling leaves illustrate that a body in motion remains in motion at a constant speed in a straight line). Students should state which law is referenced, and how it applies to the activity.

**Link to the World**

Take the class for a walk in the yard or surrounding community. Each student should take paper and pencil, and write down examples of Newton’s laws seen on the trip. For example, an empty soda can blowing down the street in the wind illustrates momentum and force. An oak leaf and an acorn falling from a tree illustrate mass and velocity. A car rolling to a stop illustrates friction. A leaf on a tree illustrates the balanced upward force of the stem holding the leaf against the downward force of gravity.
Connection to Science

In the video, the students state that gravity is a downward force. Ask if anyone knows what gravity is, then have one student look it up in the dictionary and tell the class. Ask for examples of how gravity works and what would happen if there were no gravity. Is there any place where gravity doesn’t have the same pull as on Earth? (space) How do astronauts compensate for the reduced gravity? (float rather than walk, tie down things which would float away, eat food from squeeze containers) When the astronauts are in space, they are essentially weightless. Does their mass change, too? (no)

Hands On

Bring in a sturdy rope, about five feet in length. Choose two students of approximately equal weight to have a tug of war. If the students are evenly matched, they should exert approximately equal force on the rope without one pulling the other off balance. Then add another student to one side and ask the class what happens. Add more students to each side until you have approximately five students on each side of the rope. Have the class describe what happens each time another student is added to each side. The force exerted on the side with more students should have begun to win the tug of war. The forces were equalized when both sides had the same number of pullers. However, if one side has heavier people than the other, their combined mass will exert more power than the other side, even if their numbers are equal.

Connection to Math/Science

In the video, Mr. Dexter says that a soccer ball on the moon would weigh one-sixth of what it weighs on Earth. Ask a few students to research this and tell why it happens. Weigh some objects in the room, if possible, or take a guess at their weight (you can weigh books, pencils, erasers, chairs, volunteer students). If the weight of an object on the moon is one-sixth of its weight on Earth, what would these objects weigh on the moon? Have students weigh things at home, too, and figure out what their weight would be on the moon.

Critical Thinking

Ask the class to consider what it is that allows some people to become great and imaginative thinkers and make great discoveries, or quantify natural laws of the universe, as Newton did. They should consider the effect of education (and whether book learning necessarily makes creative thinkers), previous knowledge upon which one can build, the ability to “see” connections or envision new ideas. When asked how Newton made so many discoveries, he said it was not because of luck or inspiration, but because of intense, focused concentration and persistence. Does that mean that anyone can devise mathematical laws if they concentrate enough, or is there something intangible involved, too?
Connection to Language Arts

Have students use the vocabulary words (in the reproducible pages) to play a matching game. Let them work in small groups to make flash cards on index cards or construction paper. Each vocabulary word should produce two cards, one for the word, one for the definition. Then turn all the cards face down on a table. Students may take turns turning over two cards at a time. When students draw a word and matching definition card, they keep the pair. The winner in each group is the student with the most cards.

Connection to Science

Ask for a definition of velocity (the speed at which something moves) and momentum (mass x velocity). Discuss the way in which velocity is different from momentum. What does Newton’s second law say about momentum? (the more force applied, the greater the change of momentum). Ask for examples, such as the one in the video when several students could move the car faster than one student.

Culminating Activity

Divide the class into small groups and have each group either recreate one of the demonstrations from the video, or think of one of their own. The demonstrations should illustrate one of Newton’s laws, or the effect of friction, or how opposing forces work to keep an object in equilibrium. Set aside a time for one or two demonstrations each day, until all groups have had a turn.
VOCABULARY

Match the word with its definition. Use a dictionary or review the video.

1. speed
2. An object at rest remains at rest unless acted on by an unbalanced force.
3. force that slows or prevents the movement of objects that are in contact with each other
4. An object in motion will remain in motion in a straight line at constant speed unless acted on by an unbalanced force.
5. the product of the mass in an object times its velocity
6. force in one direction without any opposing force
7. the amount of matter in an object
8. The larger the force acting on an object, the more rapidly its momentum changes.
9. forces with equal and opposing power
10. For every action force there is an equal and opposite reaction.

_____ balanced forces
_____ friction
_____ mass
_____ momentum
_____ Newton’s first law, part one

_____ Newton’s first law, part two
_____ Newton’s second law
_____ Newton’s third law
_____ unbalanced force
_____ velocity
CHECKING COMPREHENSION

Fill in the missing words or phrases. Use the Word Bank below.

_________ is a basic property of matter and is defined as the amount of __________ in an object. Momentum tells us how fast something is moving, and in what __________. The greater the momentum of an object, the more __________ it takes to stop it. When we multiply mass times momentum, we can figure out __________. Newton's first law of mass says that "an object at rest remains at rest unless acted on by a/an __________." It continues with "an object in motion will remain in motion in a/an __________ at constant speed unless acted on by an unbalanced force." Newton's second law states that the more force applied to an object, the greater will be the change of __________. The third law states that for every action, there is a/an __________ reaction force. One reaction force is __________, a force that slows or prevents movement.

WORD BANK

direction
equal and opposite
force
friction
mass
matter
momentum
straight line
unbalanced force
velocity
PICTURE THESE LAWS

Below are pictures which illustrate Newton’s laws of motion, force and mass. Using the Newton’s Law Bank, choose the law which illustrates each picture and write it on the line below the picture.

LAW BANK

1. An object in motion will remain in motion in a straight line at constant speed unless acted on by an unbalanced force.

2. An object at rest remains at rest unless acted on by an unbalanced force.

3. For every action, there is an equal and opposite reaction.

4. The greater the mass of an object, the greater its momentum.
MOMENTUM MATH

You have learned that momentum is the product of mass times velocity. If you know the mass and velocity of an object, you can figure out its momentum using multiplication. Try it with these examples.

1. A car has a mass of 2,000 lbs. and a velocity of 30 mph. What is its momentum? _______________

2. A baseball has a mass of 6 oz. and a velocity of 70 mph. What is its momentum? _______________

3. A bike has a mass of 40 lbs. and a velocity of 25 mph. What is its momentum? _______________

4. Julie runs a mile in 10 minutes. How fast does she run in miles per hour? _______________
   Her mass is 100 pounds. Using her mile per hour velocity and her mass, what is her momentum? _______________

5. A cat has a mass of five pounds and can run at 2 mph. What is its momentum? _______________
Check the box next to the correct answer.

1. The basic property of matter is called __________.
   - weight
   - mass
   - force
   - friction
   - gravity

2. An __________ force is required to move an object.
   - uneven
   - unknown
   - active
   - unbalanced
   - intrinsic

3. An object at rest remains __________ unless acted on by an unbalanced force.
   - the same weight
   - the same mass
   - at rest
   - unbalanced
   - at low momentum

4. An object in motion will remain in motion __________ unless acted on by an unbalanced force.
   - in a straight line at constant speed
   - without friction
   - according to its velocity
   - with increased momentum
   - which decreases

5. The force which slows or prevents movement of objects in contact with each other is called __________.
   - momentum
   - friction
   - velocity
   - gravity
   - mass
6. Velocity tells us the speed and _________ in which something is moving.
   - momentum
   - mass
   - rate
   - time
   - direction

7. Momentum is the product of the mass of an object times its _________.
   - gravity
   - friction
   - force
   - velocity
   - direction

8. The more force applied to an object, the _________ the change of momentum.
   - greater
   - less
   - wider
   - straighter
   - heavier

9. For every action, there is an _________ and opposite reaction.
   - unbalanced
   - alternate
   - equal
   - elemental
   - active

10. The momentum of a baseball can be increased by increasing its _________.
    - angle
    - velocity
    - distance
    - arc
    - friction
ADDITIONAL AIMS MULTIMEDIA PROGRAMS

You and your students might also enjoy these other AIMS Multimedia programs:

Atoms and Molecules
Diffusion and Phase Changes of Matter
Weather: Air in Action
Heat: Molecules in Motion
Mass and Density: Investigating Matter
Electrical Current and Magnetism
It's Chemical Series
  Density in Solids
  Phase Changes
  Density in Liquids
  Density in Gases
VOCABULARY

Match the word with its definition. Use a dictionary or review the video.

1. speed
2. An object at rest remains at rest unless acted on by an unbalanced force.
3. force that slows or prevents the movement of objects that are in contact with each other
4. An object in motion will remain in motion in a straight line at constant speed unless acted on by an unbalanced force.
5. the product of the mass in an object times its velocity
6. force in one direction without any opposing force
7. the amount of matter in an object
8. The larger the force acting on an object, the more rapidly its momentum changes.
9. forces with equal and opposing power
10. For every action force there is an equal and opposite reaction.

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<td>2</td>
<td>Newton's first law, part one</td>
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Mass is a basic property of matter and is defined as the amount of matter in an object. Momentum tells us how fast something is moving, and in what direction. The greater the momentum of an object, the more force it takes to stop it. When we multiply mass times momentum, we can figure out velocity. Newton’s first law of mass says that “an object at rest remains at rest unless acted on by a/an unbalanced force.” It continues with “an object in motion will remain in motion in a/an straight line at constant speed unless acted on by an unbalanced force.” Newton’s second law states that the more force applied to an object, the greater will be the change of momentum. The third law states that for every action, there is a/an equal and opposite reaction force. One reaction force is friction, a force that slows or prevents movement.

**WORD BANK**
- direction
- equal and opposite
- force
- friction
- mass
- matter
- momentum
- straight line
- unbalanced force
- velocity
PICTURE THESE LAWS

Below are pictures which illustrate Newton's laws of motion, force and mass. Using the Newton's Law Bank, choose the law which illustrates each picture and write it on the line below the picture.

LAW BANK

1. An object in motion will remain in motion in a straight line at constant speed unless acted on by an unbalanced force.

2. An object at rest remains at rest unless acted on by an unbalanced force.

3. For every action, there is an equal and opposite reaction.

4. The greater the mass of an object, the greater its momentum.
MOMENTUM MATH

You have learned that momentum is the product of mass times velocity. If you know the mass and velocity of an object, you can figure out its momentum using multiplication. Try it with these examples.

1. A car has a mass of 2,000 lbs. and a velocity of 30 mph. What is its momentum? **6,000 mph**
2. A baseball has a mass of 6 oz. and a velocity of 70 mph. What is its momentum? **420 mph**
3. A bike has a mass of 40 lbs. and a velocity of 25 mph. What is its momentum? **1,000 mph**
4. Julie runs a mile in 10 minutes. How fast does she run in miles per hour? **6 mph**
   Her mass is 100 pounds. Using her mile per hour velocity and her mass, what is her momentum? **600 mph**
5. A cat has a mass of five pounds and can run at 2 mph. What is its momentum? **10 mph**
Check the box next to the correct answer.

1. The basic property of matter is called __________.
   - weight
   - mass
   - force
   - friction
   - gravity

2. An __________ force is required to move an object.
   - uneven
   - unknown
   - active
   - unbalanced
   - intrinsic

3. An object at rest remains __________ unless acted on by an unbalanced force.
   - the same weight
   - the same mass
   - at rest
   - unbalanced
   - at low momentum

4. An object in motion will remain in motion __________ unless acted on by an unbalanced force.
   - in a straight line at constant speed
   - without friction
   - according to its velocity
   - with increased momentum
   - which decreases

5. The force which slows or prevents movement of objects in contact with each other is called __________.
   - momentum
   - friction
   - velocity
   - gravity
   - mass
6. Velocity tells us the speed and _________ in which something is moving.
   - momentum
   - mass
   - rate
   - time
   - direction

7. Momentum is the product of the mass of an object times its _________.
   - gravity
   - friction
   - force
   - velocity
   - direction

8. The more force applied to an object, the _________ the change of momentum.
   - greater
   - less
   - wider
   - straighter
   - heavier

9. For every action, there is an _________ and opposite reaction.
   - unbalanced
   - alternate
   - equal
   - elemental
   - active

10. The momentum of a baseball can be increased by increasing its _________.
    - angle
    - velocity
    - distance
    - arc
    - friction