Standard #: SC.5.P.13.1

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Identify familiar forces that cause objects to move, such as pushes or pulls, including gravity acting on falling objects.

Subject Area: Science

Grade: 5

Body of Knowledge: Physical Science

Idea: Level 1: Recall

Big Idea: Forces and Changes in Motion - A. It takes energy to change the motion of objects.

Date Adopted or Revised: 02/08

B. Energy change is understood in terms of forces--pushes or pulls.

C. Some forces act through physical contact, while others act at a distance.

Clarification for grades K-5: The target understanding for students in the elementary grades should focus on Big Ideas A, B, and C.

Clarification for grades 6-8: The target understanding for students in grades 6-8 should begin to transition the focus to a more specific definition of forces and changes in motion. Net forces create a change in motion. A change in momentum occurs when a net force is applied to an object over a time interval.

Grades 9-12, Standard 12: Motion - A. Motion can be measured and described qualitatively and quantitatively. Net forces create a change in motion. B. Momentum is conserved under well-defined conditions. A change in momentum occurs when a net force is applied to an object over a time interval.

Content Complexity Rating: Level 1: Recall - More Information

Date of Last Rating: 05/08

Status: State Board Approved

Assessed: Yes

Remarks/Examples

Annually assessed on Grade 5 Science FCAT 2.0. Also assesses SC.3.E.5.4 and SC.4.P.8.4.

TEST ITEM SPECIFICATIONS

Item Type(s): This benchmark will be assessed using: MC item(s)

Also Assesses
SC.3.E.5.4 Explore the Law of Gravity by demonstrating that gravity is a force that can be overcome.

SC.4.P.8.4 Investigate and describe that magnets can attract magnetic materials and attract and repel other magnets
Clarification :
Students will identify familiar forces that affect how objects move.

Students will identify scenarios whereby gravity is overcome.

Students will identify and/or describe examples of magnetic attraction and repulsion.
Content Limits :
Items assessing familiar forces are limited to pushes, pulls, friction, gravity, and magnetic force.

Items may only require the interpretation of two forces at a time.

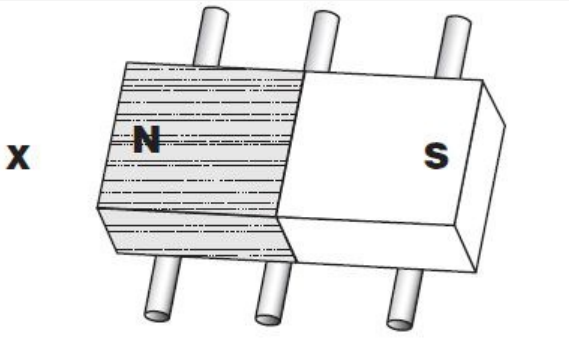
Items referring to friction will only assess the force of friction as a resistance to movement.

Items that assess magnetic attraction will not use the context of separating mixtures and solutions.
Stimulus Attributes :
None specified
Response Attributes :
None specified
Prior Knowledge :
Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge from SC.K.E.5.1, SC.K.P.13.1, SC.1.E.5.2, SC.1.P.13.1, SC.2.P.13.1, SC.2.P.13.2, SC.2.P.13.3, and SC.2.P.13.4.

SAMPLE TEST ITEMS (1)

Test Item #: Sample Item 1

Question: Bar magnets have a north pole (N) and a south pole (S). Latrisha places a bar magnet on three small straws so that it can roll. Her setup is shown below.



Placing which of the following objects at point X will cause the bar magnet to move away from point X?

Difficulty: N/A

Type: MC: Multiple Choice

Related Courses

Course Number	Course Title
5020060:	Science - Grade 5 (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
7720060:	Access Science Grade 5 (Specifically in versions: 2014 - 2015, 2015 - 2018, 2018 and beyond (current))
5020120:	STEM Lab Grade 5 (Specifically in versions: 2016 and beyond (current))

Related Access Points

Independent

Access Points Number	Access Points Title
SC.5.P.13.In.1:	Distinguish between movement of an object caused by gravity and movement caused by pushes and pulls.

Supported

Access Points Number	Access Points Title
SC.5.P.13.Su.1:	Recognize that gravity causes an object to move.

Participatory

Access Points Number	Access Points Title
SC.5.P.13.Pa.1:	Recognize that pushing or pulling makes an object move.

Related Resources

Virtual Manipulative

Name	Description
A Pendulum:	This virtual manipulative will help the students learn some important concepts of classical mechanics, such as gravitational acceleration, energy conservation and so on. This activity will also help in students learning via the process of making predictions (about number of pendulum swings), discussing outcomes and sharing results.
A Pulley System:	This activity will help the students in understanding the concept of the pulley and how it can be helpful in lifting heavy weights. Students will recognize the structure of a pulley which is a wheel on an axle that is designed to support movement of a cable or a belt along its circumference.
Balance Challenge Game:	Play with objects on a teeter totter to learn about balance. • Predict how objects of various masses can be used to make a plank balance. • Predict how changing the positions of the masses on the plank will affect the motion of the plank • Write rules to predict which way plank will tilt when objects are placed on it. • Use your rules to solve puzzles about balancing.
	Students can create an applied force and see how it makes objects move. They can also make changes in friction and see how it affects the motion of objects.

Explore the forces:	• Identify when forces are balanced vs. unbalanced. • Determine the sum of forces (net force) on an object with more than one force on it. • Predict the motion of an object with zero net force. • Predict the direction of motion given a combination of forces.
Friction (at Molecular Workbench):	Friction is important in enabling the movement of objects. Friction is a force that acts in an opposite direction to movement. Friction is everywhere when objects come into contact with each other. Observe what happens when the surfaces are very smooth or slippery, it reduces the friction and thus it makes harder to stop the motion.

Lesson Plan

Name	Description
Air Time 3D Printing MEA:	The students follow the engineering process to assist Worldwide Food Distribution Mission improve their food delivery device in order to deliver food to remote parts of the world.
Balanced or Nah (Not):	In this lesson, Balanced or Nah, the students will collaborate within groups to create a scenario or demonstration where they will explain concepts related to forces and motion. The students will conclude the lesson with a written essay or paragraphs explaining their concept and the concepts of other presenters.
Blast Off - An Engineering Design Challenge:	This Engineering Design Challenge is intended to help students apply the concepts of forces from SC.5.P.13.1 and SC.5.P.13.2 by building and launching straw rockets. It may also be used as introductory instruction of the content.
Bottling Rockets:	In this lesson, students will explore the concepts of force and motion as they use the engineering design process to create and test rockets. Students will demonstrate their understanding of familiar forces by creating and presenting a poster. Take students up, up, and away with this engaging lesson!
Clean Dat "SPACE" Inc.:	This Model Eliciting Activity (MEA) is written at a 5th grade level. Clean Dat "SPACE" MEA provides students with an engineering problem in which they must work as a team to design a procedure to select the best space junk cleanup company for the purpose of keeping the International Space Station safe while in orbit.
Forces and Movement:	Students use a virtual manipulative to show how different size forces change the movement of two objects of different size. The Web page also has a worksheet and online quiz available to check for understanding of how force, size, and motion are related.
Friction Time!!!:	In this lesson, students explore friction using ramps, matchbox cars, books, and a beach towel. The beach towels are used to increase the friction between the cars and the surface. The books are used to increase the speed in which the car travels, and later changing the number of text books allows the students to explore the effect of mass on friction.
Hoverama:	In this lesson students will create a model hovercraft. The challenge is to lift the most mass. Students will use their knowledge of forces and how increased mass interacts with motion. They will need to follow a budget in order to purchase building material for their hovercraft. While budgeting, students will apply real world mathematical (money) problem solving. Students will use iPads to record and document the process of the engineering and building of their model hovercrafts.
Lunar Landers: Exploring Gravity :	The attached engineering design lesson plan elaborates on the PBS Kids online resource and will probably take from 4-5 class periods. It takes the students through the engineering design process which includes the following components: Identify the Problem, Brainstorm and Design a Solution, Test and Evaluate, Redesign, Reflect and Share the Solution.
Magnets 1: Magnetic Pick-Ups:	In Magnets 1: Magnetic Pick-ups, students will look at various objects, make predictions about whether they are magnetic, and then test their predictions. This exploration is an introductory activity to magnets and magnetism.
Newton's First Law of Motion Part 1 of 3:	This lesson plan is the first in a series of connected lessons on Sir Isaac Newton's Laws of Motion published on CPALMS. This lesson provides a brief background of Sir Isaac Newton and covers Newton's First Law of Motion.
Pendulum Inquiry:	Pendulums are a fun and engaging way for students to learn about physics and the nature of science. In this lesson, students will investigate the effects of gravity, mass, changing variables and energy transfer through building their own pendulums as well as teacher demonstration.
Pendulum Inquiry - Wrecking Balls:	In this lesson, students will mimic a wrecking ball by manipulating the variables of a pendulum in order to move objects with different masses. It is recommended this lesson follow Pendulum Inquiry (see Related CPALMS Resources), which will build students' content knowledge on pendulums. Students can apply their understanding of pendulums gained from the lesson Pendulum Inquiry to assist them in designing wrecking ball pendulums in this lesson.
Pop Goes the Balloon, a Rube Goldberg Design Project:	The students will work in small groups in order to build a "Rube Goldberg" machine. A "Rube Goldberg" machine is modeled after a famous cartoonist who tried to make more difficult ways to accomplish simple tasks, such as popping a balloon. The students will build one machine, made from many simple machines working together, to perform their task. The machine is only permitted to be touched at the beginning and must work independently from that point on.
Sail Away - An Engineering Design Challenge:	This Engineering Design Challenge is intended to help students apply the concepts of forces from SC.5.P.13.1 and SC.5.P.13.2 as well as energy and its ability to cause motion from SC.5.P.10.1 and SC.5.P.10.2 by designing a boat and racing it. It may also be used as introductory instruction of the content.
The Coasta with the Mosta:	Students will create an exciting and thrilling roller coaster model. Students will use their knowledge of forces to build a model of a roller coaster using foam insulation and a marble.
We're Curious!—An Engineering Design Challenge:	This Engineering Design Challenge is intended to help students apply the concepts of forces as they build containers to protect their eggs in an egg drop. It is not intended as an initial introduction to this benchmark.
When the Wind Blows:	This is an engineering design process lesson that covers forces and motion. It is designed to engage students using hands-on problem solving strategies.
	This MEA asks students to assist Ms. Joy Ride who is creating a virtual TV series about extreme roller coasters. They

X-treme Roller Coasters:	work together to determine which roller coaster is most extreme and should be featured in the first episode. Students are presented with research of five extreme roller coasters and they must use their math skills to convert units of measurements while learning about force and motion.

Formative Assessment

Name	Description
Bounce Back Ball:	Students will be working in teams of four to measure the rebound heights of a tennis ball dropped from four different heights. Students will be investigating with the bouncing balls to measure changes in the type of energy they possess.

Perspectives Video: Teaching Idea

Name	Description
Dropsonde Construction and Hurricane Forces:	Don't get too carried away, but make sure you are having fun while learning about how hurricane researchers gather data! Produced with funding from the Florida Division of Cultural Affairs.
Paper Glider Forces:	Have you ever wanted to fly paper airplanes for fun while learning about the science of flight? Here's your chance! Produced with funding from the Florida Division of Cultural Affairs.
Pinewood Derby Forces and Motion:	Let's get rolling and explore the physics behind rolling cars! Make sure you stay on track. Produced with funding from the Florida Division of Cultural Affairs.

Teaching Idea

Name	Description
Forces:	Students model a luge track to compare the amount of friction provided by different surfaces and the affect of slope on an object's speed.
Forces Lab:	This set of interactive online simulations shows the forces that may be at work on geologic structures or on man-made structures during an earthquake. Users can see examples of compression, tension, bending, and torsion. Each simulation also features a link to a photo of a real-life example.
Gravity Launch:	The focus of this lesson will be mainly on earth's gravitational pull, as well as forces and how the motion of an object changes by using an interactive rocket launch to explore how the earth's and moon's gravity affects the path of the rocket as it is launched into space.
Newton Laws of Motion-SeaWorld Classroom Activity:	Students will correlate Newton's Laws to various animal behaviors.
The Mystery of Tiny Algal Spores:	In this video, students will learn from a researcher about adaptations algae have developed to enable them to withstand water forces in their habitat.

Educational Game

Name	Description
Science Vocabulary Hangman:	This interactive game uses the traditional hangman premise with all questions and answers involving science vocabulary. There are general sets of science vocabulary to choose from, as well as specific topics. You can even choose vocabulary pertaining to 5th or 8th grade FCAT Science Tests!

Student Resources

Name	Description
A Pendulum:	This virtual manipulative will help the students learn some important concepts of classical mechanics, such as gravitational acceleration, energy conservation and so on. This activity will also help in students learning via the process of making predictions (about number of pendulum swings), discussing outcomes and sharing results.
Balance Challenge Game:	Play with objects on a teeter totter to learn about balance. • Predict how objects of various masses can be used to make a plank balance. • Predict how changing the positions of the masses on the plank will affect the motion of the plank • Write rules to predict which way plank will tilt when objects are placed on it. • Use your rules to solve puzzles about balancing.
Explore the forces:	Students can create an applied force and see how it makes objects move. They can also make changes in friction and see how it affects the motion of objects. • Identify when forces are balanced vs. unbalanced. • Determine the sum of forces (net force) on an object with more than one force on it. • Predict the motion of an object with zero net force. • Predict the direction of motion given a combination of forces.
Friction (at Molecular Workbench):	Friction is important in enabling the movement of objects. Friction is a force that acts in an opposite direction to movement. Friction is everywhere when objects come into contact with each other. Observe what happens when the surfaces are very smooth or slippery, it reduces the friction and thus it makes harder to stop the motion.

Parent Resources

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