



5th Grade - Science - Forces and Motion

Unit: Science , Grade(s) 5

Grade 5: Forces and Motion

Duration: 9 Weeks

Unit

Scope and Sequence

Topic: Forces and Motion

Duration: 9-10 Weeks

Performance Objectives

SWBAT:

- correctly utilize measurement tools IOT measure an object's movement in terms of speed
- describe an object's speed, velocity, and acceleration IOT show how an object's motion and location can change.
- identify patterns of motion IOT predict an object's future motion
- describe the forces acting on an object IOT determine whether an object will move, change speed, or change direction.
- describe the effects of gravity and friction IOT explain how forces affect an object's motion.
- plan and conduct an observation IOT provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
- show how objects resist changes in motion IOT demonstrate the concept of inertia.

Key Terms and Definitions

force – a push or pull exerted on an object in order to change the motion of the object; force has size and direction

motion – an object's change in position relative to a reference point

speed – the distance traveled divided by the time it took to travel

projectile motion – the curved path that an object follows when thrown, launched, or otherwise projected

free fall – the motion of an object when only the force of gravity is acting on it

balanced forces – two forces acting on an object in opposite directions and of equal sizes

unbalanced forces – two forces acting on an object that are not equal in size; they cause an object to move, stop, change speed, or change direction.

net force – the combination of all of the forces acting on an object

mass – a measure of the amount of matter in an object

gravity – a force of attraction between objects that is due to their masses

friction – a force that opposes motion between two surfaces that are in contact

velocity – the speed of an object in a particular direction

acceleration – the rate at which velocity changes over time; an object accelerates if its speed, direction, or both change

inertia – the tendency of an object to resist being moved or, if the object is moving, to resist a change in speed or direction until an outside force acts on the object

Essential Questions

How do balanced and unbalanced forces affect the motion of an object?

How can the laws of motion help you predict future motion of an object?

Starting Points



Upon beginning this unit, students should have a basic knowledge of the physics topics of energy (3rd grade unit) and magnetism and electricity (4th grade unit). More specifically, in terms of energy, it will be important for students to have an understanding of the types of energy and how energy can convert from one form to another form. Students should also know the basic properties of magnets and how electricity is formed. Students will use this knowledge in this unit in order to describe how energy and energy transformations can create motion as well as how the forces present in interactions between magnets.

Students should also have a solid understanding of mass (and how it differs from weight) because they will need to understand how mass affects motion by the end of this unit.

Instructional Resources

Unit Assessment Questions

[Click here](#) for assessment questions aligned to each objective in this unit. Use these questions as planning tools, formative assessment items, exit slip questions, or unit test questions.

CK12 FlexBook Textbook (see "force and motion" section):

<http://www.ck12.org/physical-science/>

Demonstrations taken from Holt Science Forces and Motion text:

http://my.hrw.com/schoolnet/pa/philadelphia/assets/HST_Short_Courses/Forces_Motion_and_Energy/ForcemotionenergyTE/04Chapter02.pdf

Online activities listed here (particularly under the Newton's Laws section):

<http://sciencespot.net/Pages/kdzphysics.html>

Motion and Speed graphs worksheet:

http://camillasenior.homestead.com/motion_graphs.pdf

Interactive video clips demonstrating force and motion

<https://ees-ecsd-fl.schoolloop.com/forcemotion>

Force and motion race car experiment

<http://librarianismchronicles.blogspot.com/2010/01/force-and-motion-experiment.html>

Marshmallow shooter demonstration/activity

<http://tekyteach.blogspot.com/2011/11/force-and-motion-marshmallow-shooters.html>

Lab for exploring friction

<http://www.eia.gov/kids/resources/teachers/pdfs/FrictionElementary.pdf>

Newton's three laws of motion information

<http://teachertech.rice.edu/Participants/louviere/Newton/index.html>

Video of mass vs. weight

http://www.pbslearningmedia.org/asset/npe11_vid_massweight/

Bill Nye force and motion video

<https://www.schooltube.com/video/c74a9a495e7544dba30a/bill%20nye%20-%20motion>

Bill Nye inertia video

<https://www.youtube.com/watch?v=7COUk5eh6jY>

Friction video clip

<http://www.bbc.co.uk/education/clips/z79rkqt>

Eligible Content:



- S3.C.3.1.1 Identify and describe an object's motion (e.g. start/stop, up/down, left/right, faster/slower, spinning)
- S3.C.3.1.2 Describe an object's position in terms of its relationship to another object or stationary background (e.g. behind, beside, on top of, above, below)
- S4.C.3.1.1: Describe changes in motion caused by forces (e.g., magnetic, pushes or pulls, gravity, friction)
- S4.C.3.1.2: Compare the relative movement of objects or describe types of motion that are evident (e.g., bouncing ball, moving in a straight line, back and forth, merry-go-round)
- S4.C.3.1.3: Describe the position of an object by locating it relative to another object or a stationary background (e.g. geographic direction, left, up)
- S4.1.3.1: Observe and record change by using time and measurement

PA Standards

- 3.2.3.B1 Observe and describe changes in an object's motion.
- 3.2.4.B1 Explain how an object's change in motion can be observed and measured.
- 3.2.5.B1 Explain how mass of an object resists change to motion.

Next Generation Science Standards

- 3-PS2-1 Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
- 3-PS2-2 Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.
- 5-PS2 The gravitational force of Earth acting on an object near Earth's surface pulls that object towards the planet's center.
- S4.1.3.2: Describe relative size, distance, or motion
- S5.C.3.1.1: Differentiate between the mass and weight of an object
- S5.C.3.1.2: Explain how the mass of an object resists change to motion (inertia)

Enrichment Opportunity - Carver Science Fair

Encourage your students to conduct an investigation to enter into the Carver Science Fair this year. This Philadelphia tradition has been going for 37 years. Please see this website for more information: www.carversciencefair.org.

Additional Properties

Author: Curriculum, Specialist

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Keywords:

Created by: DON, PAULA (7/8/2015 5:17 PM)

Last modified by: Curriculum, Specialist (8/29/2017 3:06 PM)