

FORCE, MOTION & SIMPLE MACHINES Force & Motion Series

Written by George Graybill, Ph. D.

GRADES 5 - 8 Reading Levels 3 - 4



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P.O. Box 19729 San Diego, CA 92159 Tel: 1-800-663-3609 / Fax: 1-800-663-3608 Email: service@classroomcompletepress.com

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Critical Thinking Skills

Force, Motion & Simple Machines

Force – Motion – Simple Machines – All three

			Reading Comprehension							
	Skills For Critical Thinking	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7	Section 8	Hands-on Activities
LEVEL 1 Knowledge	 List Details/Facts Recall Information Match Vocab. to Definitions Define Vocabulary Label Diagrams Recognize Validity (T/F) 	5555 5	~ ~ ~ ~ ~	~ ~ ~ ~ ~ ~ ~	~ ~ ~ ~ ~ ~ ~ ~	<u> </u>	>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>	>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>	 <td>5 5 - 5 5</td>	5 5 - 5 5
LEVEL 2 Comprehension	 Demonstrate Understanding Explain Scientific Causation Rephrasing Vocab. Meaning Describe Classify into Scientific Groups 	>>>>>>	>>>>>	>>>>>	>>>>>	>>>>>	>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>	>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>	 < < < 	~ ~ ~ ~ ~ ~ ~ ~ ~
LEVEL 3 Application	 Application to Own Life Model Scientific Process Organize & Classify Facts Use Alternative Research Tools 	>>>	555	555	>>>	555	555	5 5 5	~ ~ ~	5555
LEVEL 4 Analysis	 Distinguish Roles/Meanings Make Inferences Draw Conclusions Based on Facts Provided Classify Based on Facts Researched 	5	S S	> > >	> > >	5	5 5 5	5	~	· · · ·
LEVEL 5 Synthesis	 Compile Research Information Design & Application Create & Construct Imagine self in Scientific Role 	1	1	1	555	s	1	1		> > > > >
LEVEL 6 Evaluation	• State and Defend an Opinion					1				5

Based on Bloom's Taxonomy

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- Enter pass code CC4510D for Activity Pages.









Assessment Rubric

Force, Motion & Simple Machines

Student's Name: _____ Assignment: _____

Level:

	Level 1	Level 2	Level 3	Level 4
Understanding Concepts	Demonstrates a limited understanding of concepts. Requires teacher intervention.	Demonstrates a basic understanding of concepts. Requires little teacher intervention.	Demonstrates a good understanding of concepts. Requires no teacher intervention.	Demonstrates a thorough understanding of concepts. Requires no teacher intervention.
Analysis and Application of Key Concepts	Limited application and interpretation in activity responses	Basic application and interpretation in activity responses	Good application and interpretation in activity responses	Strong application and interpretation in activity responses
Creativity and Imagination	Limited creativity and imagination applied in projects and activities	Some creativity and imagination applied in projects and activities	Satisfactory level of creativity and imagination applied in projects and activities	Beyond expected creativity and imagination applied in projects and activities
Application of Own Interests	Limited application of own interests in independent or group environment	Basic application of own interests in independent or group environment	Good application of own interests in independent or group environment	Strong application of own interests in independent or group environment

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STRENGTHS:

WEAKNESSES:

NEXT STEPS:





Our resource has been created for ease of use by both **TEACHERS** and **STUDENTS** alike.

Introduction

his resource provides ready-to-use information and activities for remedial students in grades five to eight. Written to grade using simplified language and vocabulary, science concepts



are presented in a way that makes them more accessible to students and easier for them to understand. Comprised of reading passages, student activities and mini posters, our resource can be used effectively for whole-class, small group and independent work.

How Is Our Resource Organized?

STUDENT HANDOUTS

Reading passages and **activities** (*in the form of reproducible worksheets*) make up the majority of our resource. The reading passages present important grade-appropriate information and concepts related to the topic. Embedded in each passage are one or more questions that ensure students understand what they have read.

For each reading passage there are BEFORE YOU READ activities and AFTER YOU READ activities.

- The BEFORE YOU READ activities prepare students for reading by setting a purpose for reading. They stimulate background knowledge and experience, and guide students to make connections between what they know and what they will learn. Important concepts and vocabulary are also presented.
- The AFTER YOU READ activities check students' comprehension of the concepts presented in the reading passage and extend their learning. Students are asked to give thoughtful consideration of the reading passage through creative and evaluative shortanswer questions, research, and extension activities

Hands-on activities are included to further develop students' thinking skills and understanding of the concepts. The **Assessment Rubric** (*page 5*) is a useful tool for evaluating students' responses to many of the activities in our resource. The **Comprehension Quiz** (*page 50*, *93*, *136*) can be used for either a follow-up review or assessment at the completion of the unit.

PICTURE CUES

Our resource contains three main types of pages, each with a different purpose and use. A **Picture Cue** at the top of each page shows, at a glance, what the page is for.



Teacher Guide

• Information and tools for the teacher



Student Handout

• Reproducible worksheets and activities



Easy Marking[™] Answer Key • Answers for student activities

EASY MARKING[™] ANSWER KEY

Marking students' worksheets is fast and easy with this **Answer Key**. Answers are listed in columns – just line up the column with its corresponding worksheet, as shown, and see how every question matches up with its answer!







Our resource is an effective tool for any SCIENCE PROGRAM.

Bloom's Taxonomy* for Reading Comprehension

The activities in our resource engage and build the full range of thinking skills that are essential for students' reading comprehension and understanding of important **science concepts**. Based on the six levels of thinking in Bloom's Taxonomy, and using language at a remedial level, information and questions are given that challenge students to not only recall what they have read, but move beyond this to understand the text and concepts through higherorder thinking. By using higher-order skills of application, analysis, synthesis and evaluation, students become active readers, drawing more meaning from the text, attaining a greater understanding of concepts, and applying and extending their learning in more sophisticated ways.

Our resource, therefore, is an effective tool for any **Science** program. Whether it is used in whole or in part, or adapted to meet individual student needs, our resource provides teachers with essential information and questions to ask, inspiring students' interest, creativity, and promoting meaningful learning.



BLOOM'S TAXONOMY: 6 LEVELS OF THINKING

*Bloom's Taxonomy is a widely used tool by educators for classifying learning objectives, and is based on the work of Benjamin Bloom.

Vocabulary

Force – Motion – Simple Machines – All three

acceleration

air resistance

amplitude

attraction

balanced

compound machine

constant

contact forces

deceleration

distance

effort distance

effort force







Force – Motion – Simple Machines – All three

electrical charge	mass	resistance force
electrostatic force	matter	rotation
energy	medium	screw
exert	meter	seismic
force	metric system	simple machine
force at a distance	motion	slope
frequency	negative	south pole
friction	net force	speed
fulcrum	newton	thread
grams	north pole	unbalanced
graph	pitch	velocity
gravity	pivot	vibrate
inclined plane	pole	vibration
joule	position	watt
kilograms	positive	wave
kinetic energy	potential energy	wavelength
lever	power	wedge
machine	pulley	weight
magnet	repel	wheel and axle
magnetic force	resistance distance	work



Force, Motion & Simple Machines CC4511

8

• •



	Irue	raise
c)	Gravity push	es us toward the Earth.
	True	False
d)	When somet	hing is sliding down a hill, friction makes it slide faster.
	True	False
e)	Friction and g	gravity are both forces.
	True	Falso

2. Write each word beside its meaning.

force	friction	gravity	pull	push
	a)	the force of the Earth pu	Illing things toward i	ts surface
	b)	a force that moves thing	ys closer	
	c)	a push or a pull		
	d)	the force that moves thin	ngs farther apart	
	e)	the force between thing	s sliding past each o	other



What Is Force?

force is a push or a pull. When you push on your pencil, you are exerting a force. When you pull a carrot out of the ground, you are exerting a force.

W Reading Passage

Forces act on you every day from all directions. You exert forces on many things every day. You must exert force



to ride a bicycle. Your foot exerts a pushing force on the pedal. When the pedals move, they pull on the chain. The chain makes the back wheel turn. The wheel pushes on the ground, and you and the bicycle move forward.

When you use the bike's brakes, the bike stops because of another force called **friction**. Why does the bike stay on the ground instead of floating off into the sky? This isn't as silly as it sounds. The bike is held down by another force called **gravity**. We will learn about friction, gravity, and other forces later.



Some things *sound* forceful that are not forces. Power, work, speed, mass, and energy are *not* kinds of force. Each of these is measured in a different way than force.

To tell about a force, we must tell both the amount of the force, and the direction in which it is acting. We can show both with an arrow. The arrow points in the direction the force is acting, and the length of the arrow shows the amount of force. The picture shows some of the forces acting when a person rides a bicycle.

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After You Read 🌪

- 1. Put a check mark (\checkmark) next to the answer that is most correct.
 - a) Which of these is a force?
 - O A energy
 - **B** gravity
 - O c power
 - O **D** work

b) Which of these tells what force is?

- O A being able to do work
- O B any kind of push or pull
- O c anything that has energy
- O **D** something that is moving
- c) What do we call the force that makes a car come to a stop when the driver puts on the brakes?
 - \bigcirc **A** friction
 - \bigcirc **B** gravity
 - \bigcirc **c** mass
 - O **D** speed

2. a) Circle the words that are kinds of force.							
energy	friction	gravity	mass	power			
pull	push	speed	work				
b) Cross out the words that are <i>not</i> kinds of force.							
energy	friction	gravity	mass	power			
pull	push	speed	work				
~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~				

# What Is Force?



Answer the questions in complete sentences.

After You Read 🌪

3. Write a sentence that describes all forces.

4. Forces can be shown as an arrow. What two things does an arrow show us about a force?

# **Extension & Application** 5. A worker is pushing heavy carts. At least four forces are acting on the cart. Describe or name **two** of the forces. Draw **arrows** to show the two forces you named above. Draw the arrows on the picture.



# **Kinds of Force**

🔰 Before You Read



- **c** a thing that moves
- **D** something that does work

#### b) Which force makes things fall to Earth?

- **A** friction
- **B** gravity
- **c** air resistance
- **D** magnetic force

#### c) Which force only acts between things that are touching?

13

- **A** friction
- **B** gravity
- **c** magnetic force
- **D** electrostatic force

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**Kinds of Force** 



e can divide forces into two kinds. Some forces are **contact forces**, and other forces exert **force** 

Reading Passage

**at a distance.** "Contact" means things must touch for one thing to exert a force on the other. "Force at a distance" means a force acts on something without touching it.

Contact forces make the most sense to us. We push on something with our hands and it moves away from us. We pull on something and it follows us. We feel the push or pull and see the motion.

Contact forces don't always cause motion. No matter how hard you push on the side of a house, it won't move. You can pull on a locked door and it won't open. It sounds funny, but this is because no matter how hard you pull, the door pulls back just as hard!



Another contact force is the force of friction. This is the force that acts between two things that are touching and sliding past each other. The force of friction is large between rough surfaces and small between smooth surfaces. Friction always acts against **sliding motion**. If the force of friction is large enough, the thing won't slide at all.



# **Kinds of Force**

Reading Passage

hink about trying to push a large rock along the sidewalk. The force of friction acts against your push. When your pushing force is greater than the force of friction, the rock will start to move. Friction does not stop after you get the rock moving. Now it acts to slow the rock down. The rock would be easier to push on ice. Ice is smooth, so the friction is low. But even on ice, there would be a little friction acting against the motion of the rock.

Air resistance is another contact force. When you move through air, the tiny bits of air push against you. We can't see air, but it is made of **matter** and has **mass** so it resists movement. We don't notice air slowing us down unless we are moving very fast or walking into a strong wind.



Some forces can push or pull on things without touching them. This sounds strange—like a power Superman might have—but it's true. One force at a distance you have felt is gravity. Gravity is the force of **attraction** between the mass in one thing and the mass in another thing. You can't feel it unless one of the things is *very* massive, like the Earth. So it is the attraction between your mass and the mass of Earth that holds you to the surface and that makes you fall out of trees.

Two other forces that act without touching are **magnetic force** and **electrostatic force.** Magnetic force acts between **magnets**, and electrostatic force acts between things that have an **electrical charge**. You will learn more about these three forces at a distance later in this book. And, yes, these forces **are** a bit strange. Scientists still don't understand everything about them.



**Kinds of Force** 

•••• 1. Ci it i	•••••• rcle the wa	ord True if th	e statement is true.	Circle the word False if
a)	Air resistanc	ce is a contact	force.	•
	True	False		•
b)	Gravity is a	force that can	act at a distance.	•
•	True	False		•
• c)	When you p	oush on a wall,	the wall pushes back.	•
•	True	False		•
d)	Friction ma	kes things move	e faster.	
	True	False		•
e)	Gravity is th bit of matte	ne force of attro er.	action between one bi	t of matter and another
	True	False		•
• • •	• • • • • • •		• • • • • • • • • • •	•
2. a)	Circle) the	words or grou	up of words that are c	ontact forces.
fric	tion		gravity	air resistance
mo	ignetic force		electrostatic force	
b)	<u>Underline</u> t touching.	he words or g	roup of words that are	e forces that can act without
fric	tion		gravity	air resistance
mo	ignetic force		electrostatic force	
·····		EDDECC	(16)	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

# **Kinds of Force**

After You Read 🤛

#### Answer the questions in complete sentences.

3. What is a contact force? Give an example of a contact force.

4. What is force at a distance? Give an example of a force that acts at a distance.

## **Extension & Application**

5. Name, describe, or draw something that is moving that has at least three forces acting on it. One of the three forces must be a force that acts at a distance. Draw arrows to show the directions in which the forces are acting. Write the name of each force next to its arrow. If you do not draw the moving thing, tell which direction the thing is moving (left, right, up, or down). Then tell which way the arrows would point.