



CC4510

GRADES
5-8

READING
LEVELS

3-4

Aligned to
your
State
Standards

Written to
Next
Generation
Science
&
STEAM

Based on
Bloom's
Taxonomy

Force & Motion Series

Simple MACHINES

High-Interest • Low-Vocabulary



 Reproducible

PAGE 1 OF 64

CLASSROOM COMPLETE  PRESS

For the Classroom of Tom Campbell

STARBUCKS EX1021



SIMPLE MACHINES

Force & Motion Series



Written by George Graybill, Ph. D.

GRADES 5 - 8
Reading Levels 3 - 4



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Critical Thinking Skills

Simple Machines

Skills For Critical Thinking		Reading Comprehension								Hands-on Activities
		Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7	Section 8	
LEVEL 1 Knowledge	- List Details/Facts - Recall Information - Match Vocab. to Definitions - Define Vocabulary - Label Diagrams - Recognize Validity (T/F)	✓	✓	✓	✓	✓	✓	✓	✓	✓
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	✓	✓	✓	✓	✓	✓	✓	✓	✓
LEVEL 4 Analysis	- Distinguish Roles/Meanings - Make Inferences - Draw Conclusions Based on Facts Provided - Classify Based on Facts Researched	✓		✓	✓	✓	✓	✓		✓
LEVEL 5 Synthesis	- Compile Research Information - Design & Application - Create & Construct - Imagine self in Scientific Role				✓	✓				✓
LEVEL 6 Evaluation	Defend an Opinion					✓				✓

Based on Bloom's Taxonomy



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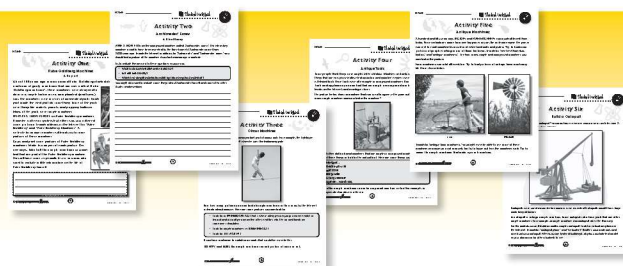
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- Go to our website:
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- Click on item CC4510 – Simple Machines
- Enter pass code CC4510D



Assessment Rubric

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

STRENGTHS:

WEAKNESSES:

NEXT STEPS:



Teacher Guide

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

Introduction

This 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 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.



Hands-on activities are included to further develop students' thinking skills and understanding of the concepts. The **Assessment Rubric** (page 4) is a useful tool for evaluating students' responses to many of the activities in our resource. The **Comprehension Quiz** (page 48) 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

How Is Our Resource Organized?

STUDENT HANDOUTS

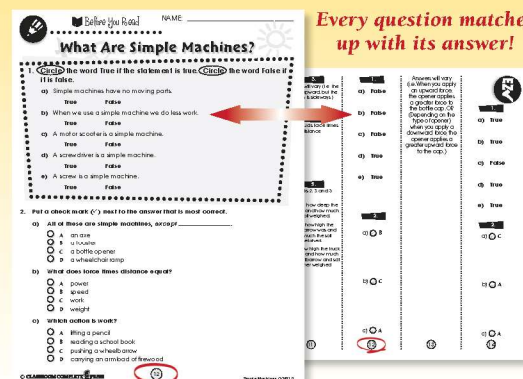
Reading passages and **activities** (in the form of reproducible worksheets) make up the majority of our resource. The reading passages present important grade-appropriate information and concepts related to the topic. Embedded in each passage are one or more questions that ensure students understand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



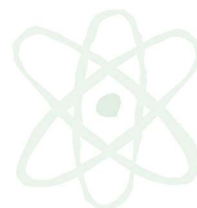
Every question matches up with its answer!



Before You Teach



Bloom's Taxonomy

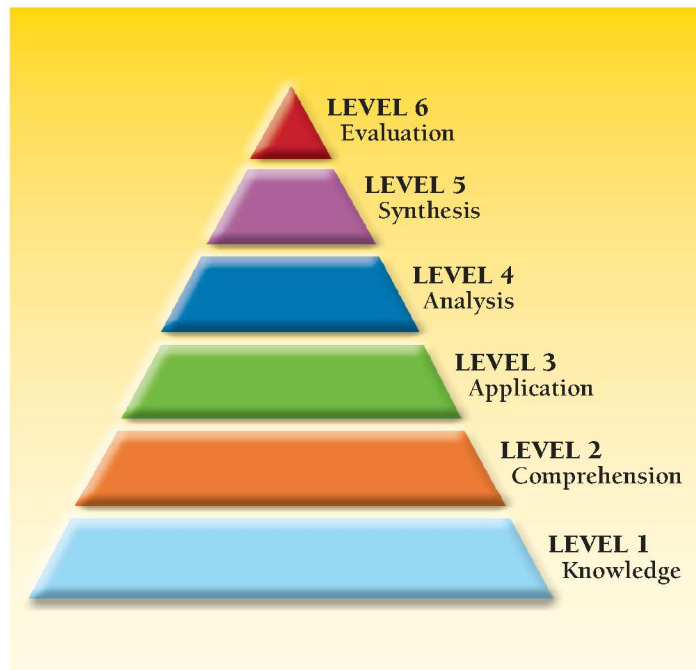


*Our resource is an effective tool for any **SCIENCE PROGRAM**.*

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 higher-order 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



compound machine	gravity	motion	screw
effort distance	inclined plane	newton	simple machine
effort force	joule	pivot	thread
energy	kinetic energy	potential energy	watt
exert	lever	power	wedge
force	machine	pulley	wheel and axle
friction	meter	resistance distance	work
fulcrum	metric system	resistance force	



What Are Force, Motion, and Work?

1. Use a straight line to match the word on the left to its meaning on the right. Use a dictionary to help you.

1

force

the force of Earth's attraction

A

2

friction

change of position

B

3

gravity

a measure of distance

C

4

meter

a push or a pull

D

5

motion

the force that resists sliding motion

E

2. **Circle** the word True if the statement is true. **Circle** the word False if it is false.

- a) Force is a pull or a push.

True**False**

- b) Friction is the force that makes things fall to the ground.

True**False**

- c) All machines have motors.

True**False**

- d) Changes in motion are caused by forces.

True**False**

- e) Weight is measured in gallons.

True**False**



What Are Force, Motion, and Work?

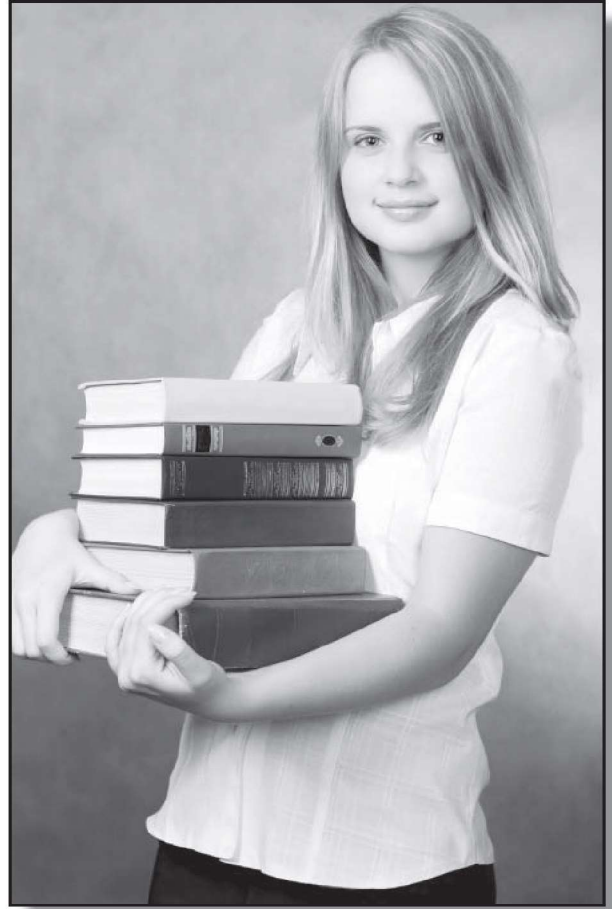
Carrying a 50-pound rock around on your shoulder all day sounds like hard **work**. If you think so, you are half right. It would be hard, but it wouldn't be work—at least not the way the word work is used in science.

To understand what work is we first have to understand **force** and **motion**. You may remember that a force is a push or a pull. You can **exert** a force on something by pushing or pulling with your hands. **Gravity** and **friction** are also common forces.

We can see motion, so we already have a feeling for what it is. When something moves from one place to another, that is motion.

When a force acts on something, it sometimes makes the thing move. If the thing moves *in the direction* that the force is acting, *that* is work. Carrying the rock wasn't work because the force on it was pushing up, and the rock was moving sideways.

Lifting the rock onto your shoulder *is* work. The force is the same as the weight of the rock and the direction of motion is up. Throwing a ball is also work because the ball moves in the direction of the force exerted by your hand.





What Are Force, Motion, and Work?

There is a way to measure the amount of work done:

Work equals force times distance ($W = F \times d$)

The force is the force that makes something move, and the distance is the total distance the thing moves. Work is measured in foot-pounds. One foot-pound is the work done by exerting one pound of force on something while moving it one foot. If your shoulder is 4 feet high, you do 200 foot-pounds of work when lifting a 50-pound rock to your shoulder ($4 \times 50 = 200$).



Tell what causes the force of gravity and in which direction it acts.

When you do work on something, you can increase its **energy**. Raising something to a greater height increases its **potential energy**. Making something move faster increases its **kinetic energy**.

In the **metric system**, distance is measured in **meters**, force is measured in **newtons**, and work is measured in **joules**. A meter is about three feet, a newton is about a quarter pound, and a joule is about three-quarters of a foot-pound.

Sometimes you get paid for doing work. When life is fair, your pay depends on how much work you do *and* on how fast you do it. The speed at which work is done is called **power**. Power is measured in joules per second. One joule per second is one **watt**. When you pay your bill to the electric company, you pay for the number of watts of electricity you used.

To find power, divide work by time ($P = W \div t$).



What Are Force, Motion, and Work?

1. Put a check mark (✓) next to the answer that is most correct.

a) Which are **both** forces?

- ☐ A work and power
- ☐ B power and gravity
- ☐ C gravity and friction
- ☐ D friction and work

b) How do you find the amount of work a force does?

- ☐ A force plus distance
- ☐ B force times distance
- ☐ C force minus distance
- ☐ D force divided by distance

c) Which word means “the speed at which work is done”?

- ☐ A force
- ☐ B power
- ☐ C kinetic
- ☐ D energy

d) What do you need to know to find out how much work you do when you pick up a cat?

- ☐ A how far you lift the cat and how much it weighs
- ☐ B how fast you lift the cat and how long you hold it
- ☐ C how long you hold the cat and how far you walk with it
- ☐ D how far you walk with the cat and how fast you walk

2. **Circle** the words or groups of words that mean “work”.

force

foot-pounds

force times distance

joules

watts

newtons

power

NAME: _____

After You Read 



What Are Force, Motion, and Work?

Answer the questions in complete sentences.

3. Explain why carrying a ten-pound bag of groceries to the car is **not** work.

4. Write a sentence that tells what the words "**distance**," "**force**," and "**work**" have to do with each other..

Extension & Application

5. Nicole planted a new rosebush in her garden. This is what she had to do:

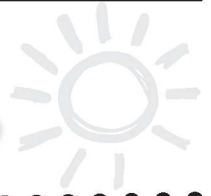
- 1) She carried the rose bush from her truck to the garden.
- 2) She dug a hole in the ground.
- 3) She shoveled the soil from the hole into a wheelbarrow.
- 4) She wheeled the wheelbarrow full of soil to the street.
- 5) She pushed the wheelbarrow up a board into the back of a truck and dumped the soil.

- a) During which tasks did Nicole **do work**?

- b) For each task where she did work, tell what you would need to know to find out **how much** work she did.



What Are Simple Machines?



1. **Circle** the word True if the statement is true. **Circle** the word False if it is false.

a) Simple machines have no moving parts.

True

False

b) When we use a simple machine we do less work.

True

False

c) A motor scooter is a simple machine.

True

False

d) A screwdriver is a simple machine.

True

False

e) A screw is a simple machine.

True

False

2. Put a check mark (✓) next to the answer that is most correct.

a) All of these are simple machines, *except* _____.

- ☐ A an axe
- ☐ B a toaster
- ☐ C a bottle opener
- ☐ D a wheelchair ramp

b) What does force times distance equal?

- ☐ A power
- ☐ B speed
- ☐ C work
- ☐ D weight

c) Which action is work?

- ☐ A lifting a pencil
- ☐ B reading a school book
- ☐ C pushing a wheelbarrow
- ☐ D carrying an armload of firewood



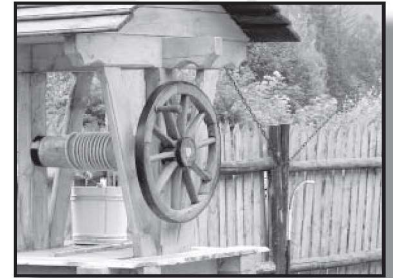
What Are Simple Machines?

A **machine** is something that makes work easier by changing the force you apply to do work. A machine can change the amount of force you apply, and it can also change the direction of the force. A **simple machine** is a machine with only one kind of movement.

There are six kinds of simple machines: **lever, wheel and axle, pulley, inclined plane, wedge, and screw**. Look at the pictures of the six simple machines. It's easy to see how most of these work and how they change the force. We will look at each of these machines later in this book.

It is important to understand that simple machines make work easier, but they don't change the *amount* of work you have to do. (That's the bad news.) What machines change is the **effort** you have to put out. (That's the good news.)

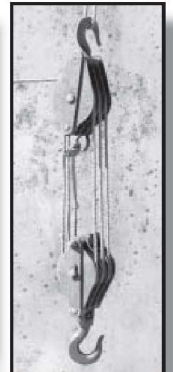
For example, you can use a kind of lever to pull a nail out of a board. You could never pull a nail out with your fingers. You might have to push the lever down ten inches to pull the nail up one inch. The nail comes right out because the pull on the nail is ten times the force of your push on the lever.



Wheel and Axle



Inclined Plane



Pulley



Wedge



Screw



Lever



How does a bottle opener change the force you apply to the handle of the opener?

Later, we will learn more about what you lose and what you gain when you use a simple machine.



What Are Simple Machines?

1. **Circle** the word True if the statement is true. **Circle** the word False if it is false.

a) A wheel and axle is a simple machine.

True

False

b) A simple machine has only one kind of motion.

True

False

c) We use simple machines so we don't have to do as much work.

True

False

d) A simple machine can change the direction of force.

True

False

e) A simple machine can change the amount of force.

True

False

2. Put a check mark (✓) next to the answer that is most correct.

a) Which of these is a simple machine?

- ☐ A bicycle
- ☐ B clock
- ☐ C pulley
- ☐ D toaster

b) Which of these is *not* a simple machine?

- ☐ A lamp
- ☐ B lever
- ☐ C screw
- ☐ D wedge

c) A simple machine can do all of these things, *except* _____.

- ☐ A change the amount of work
- ☐ B change the amount of force
- ☐ C change the amount of effort
- ☐ D change the direction of force

NAME: _____

After You Read 



What Are Simple Machines?

Answer the questions in complete sentences.

3. Explain what a simple machine is.

4. Name **two** things a simple machine can do.

Extension & Application

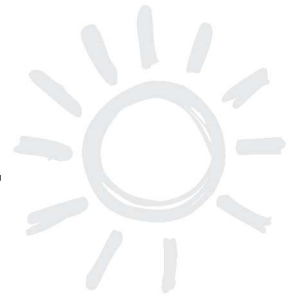
5. Name the **six** simple machines and give an example of each.

	Simple Machine	Example
1)		
2)		
3)		
4)		
5)		
6)		

6. When have you used a simple machine? What was it? How did it help you?



Levers



1. Put a check mark (✓) next to the answer that is most correct.

a) Which tells what a simple machine is?

- ☐ A a machine with no motor
- ☐ B a machine with no moving parts
- ☐ C a machine with one moving part
- ☐ D a machine with only one kind of motion

b) What does a simple machine do when it makes your effort less?

- ☐ A makes work go faster
- ☐ B makes your power more
- ☐ C makes the amount of work you do less
- ☐ D makes resistance force greater than applied force

c) All of these are simple machines, **except**

- ☐ A screw
- ☐ B pulley
- ☐ C electric fan
- ☐ D wheel and axle

2. **Circle** the word True if the statement is true. **Circle** the word False if it is false.

a) A lever is a simple machine.

True False

b) Simple machines change the effort needed to do work.

True False

c) Work equals force plus distance.

True False

d) Power is the same as energy.

True False

e) Pounds and newtons measure the same thing.

True False

3. Look up the word PIVOT in a dictionary. Write down its definition below.

The dictionary definition of **pivot** is:



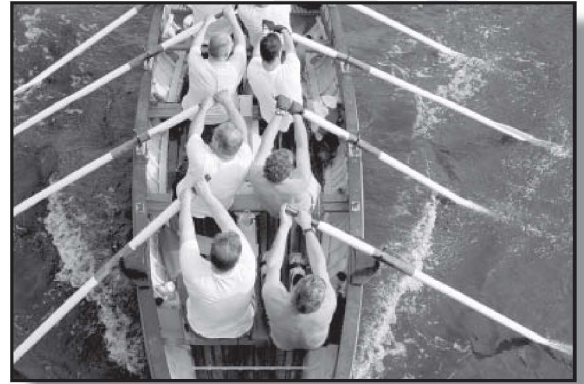
Levers

The lever was probably the first simple machine used by humans many thousands of years ago. The first person to whack something with a club was using a lever.

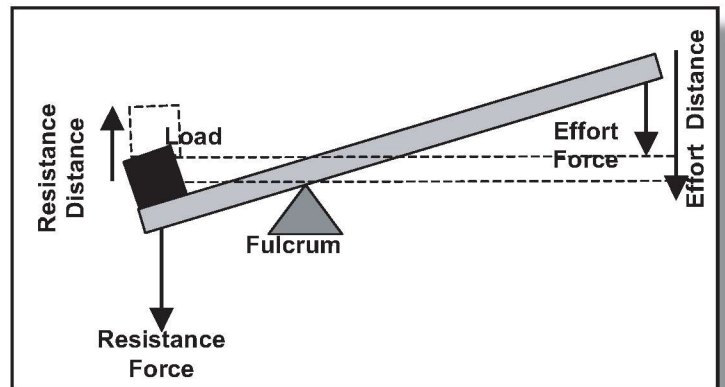
The picture shows the two parts of every lever. For every lever, a board or rod **pivots** on a point called a **fulcrum**. The force you apply is called the **effort force**. The lever changes the direction and amount of force and applies it to a load. The force the lever applies is called the **resistance force**. The distance you have to push or pull the lever is called the **effort distance**. The distance the load moves is called the **resistance distance**.

For the oars shown above, the pivot at the edge of the boat (the oarlock) is the fulcrum. The effort force is applied to the oar handle. As the handle moves through the effort distance, it applies the resistance force to the end in the water. The distance the oar moves through the water is the resistance distance.

There are three kinds of levers because there are three ways to arrange the effort, fulcrum, and load. The oar is a **first-class lever**, where the arrangement is effort-fulcrum-load. Other first-class levers are pliers, scissors, and that little tab you pull to open a can of soft drink.



Oars are First-Class Levers



A First-Class Levers



What are the two parts of every lever?



Levers



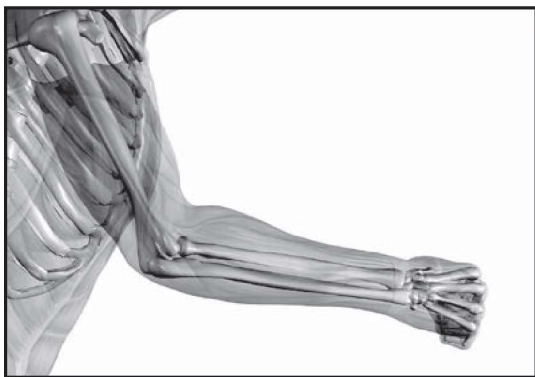
A **second-class lever** is shown below.

For a second-class lever, the arrangement is effort-load-fulcrum. Some other second-class levers are a wheel barrow and a nutcracker.

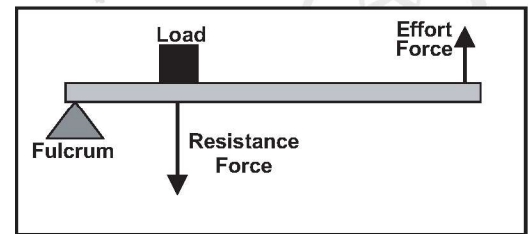
The classes are just names. It doesn't mean that first-class levers are the best. The third-class lever shown below is just as classy as the others.

For the hammer, the resistance is at the head, and the fulcrum is the back of the hand. Many other **third-class levers** are used to make the resistance force push over a long distance at a high speed. The effort force is large and moves over a shorter distance. This is also how tennis rackets, baseball bats, and brooms work as third-class levers.

Can you find another lever in the picture of the hammer? The human forearm is a lever. The elbow is the fulcrum. When the hammer comes



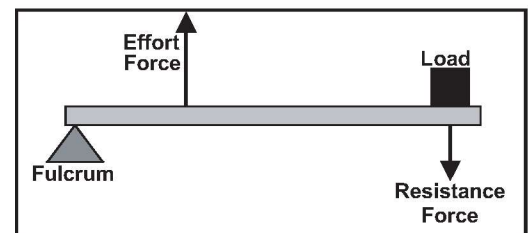
The Forearm is a First-Class Lever and a Third-Class Lever



Second-Class Lever



A Bottle Opener is a Second-Class Lever



Third-Class Lever



A Hammer is a Third-Class Lever

NAME: _____

After You Read 



Levers



1. Fill in each blank with a word from the list. All words will be used more than once.

effort

fulcrum

resistance

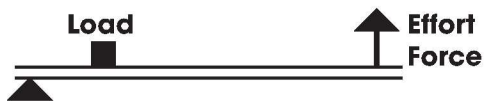
- a) A lever pivots on its .
- b) When a lever is used, the load moves through the distance.
- c) The part of a lever that is a board or rod rests on the .
- d) The force applied to a lever is called the force.
- e) The weight of the load on a lever is the force.
- f) The distance you have to push a lever is the distance.

2. Put a check mark (✓) next to the answer that is most correct.

a) Which tool is most often used as a lever?

- ☐ A a nail
- ☐ B a knife
- ☐ C a wheelchair ramp
- ☐ D a bottle opener

b) A second-class lever is shown below.



What can this lever do?

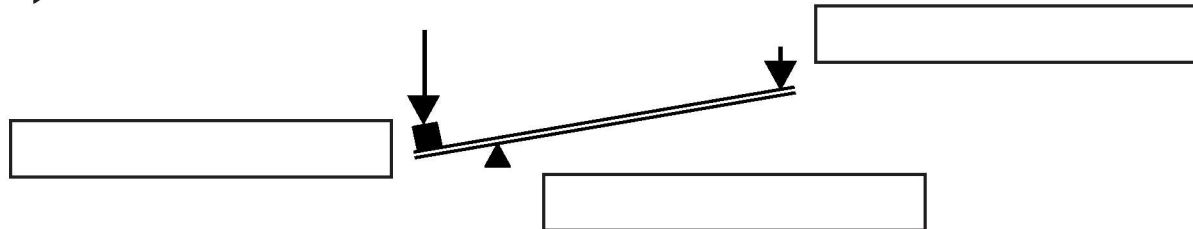
- ☐ A Make less work.
- ☐ B Change the direction on the applied force.
- ☐ C Make the force on the load greater than the effort force.
- ☐ D Make the load move faster than the place where the effort force is applied.



Levers

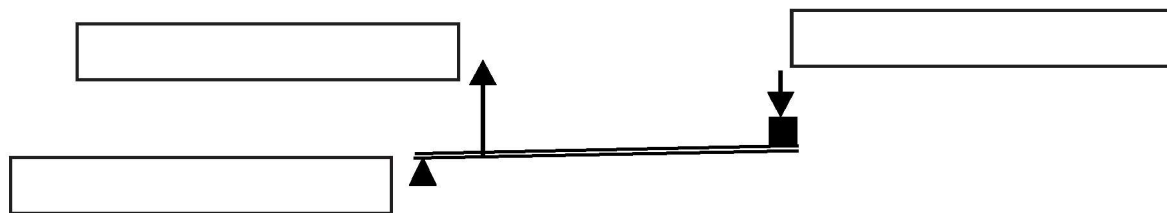
3. Answer the questions by writing the answers in the boxes.

a) A first-class lever is shown below.



Label the **effort force**, the **resistance force**, and the **fulcrum**.

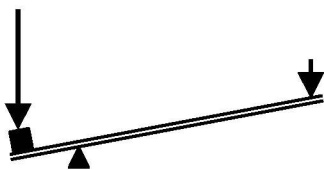
b) A third-class lever is shown below.



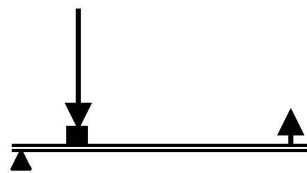
Label the **effort force**, the **resistance force**, and the **fulcrum**.

Extension & Application

4. First-class, second-class, and third-class levers are shown below.



First-Class Lever



Second-Class Lever



Third-Class Lever

Look at the **Three Classes of Levers** chart on the next page. Read the questions for each class of lever. Answer each question by writing YES or NO in the spaces provided.