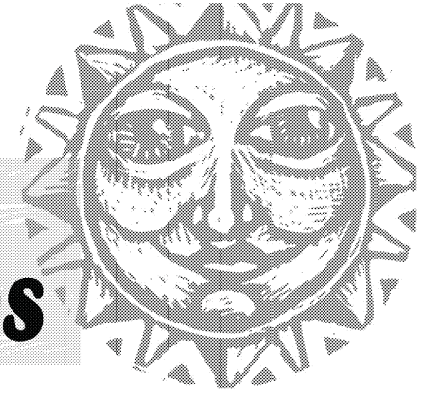
Daily *warm-ups*



PHYSICS

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The *Daily Warm-Ups* series is a wonderful way to turn extra classroom minutes into valuable learning time. The 180 quick activities—one for each day of the school year—review, practice, and teach physics. These daily activities may be used at the very beginning of class to get students into learning mode, near the end of class to make good educational use of that transitional time, in the middle of class to shift gears between lessons—or whenever else you have minutes that now go unused. In addition to providing students with fascinating physics activities, they are a natural path to other classroom activities involving critical thinking.

Daily Warm-Ups are easy-to-use reproducibles—simply photocopy the day's activity and distribute it. Or make a transparency of the activity and project it on the board. You may want to use the activities for extra-credit points or as a check on critical-thinking skills and problem-solving skills.

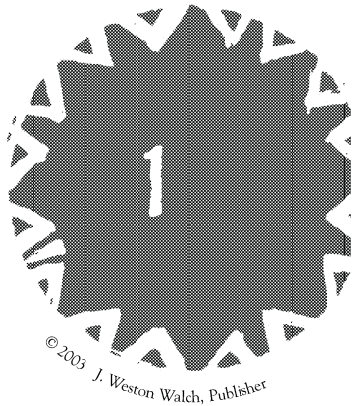
However you choose to use them, *Daily Warm-Ups* are a convenient and useful supplement to your regular lesson plans. Make every minute of your class time count!

Daily Warm-Ups: Physics

Science vs. Superstition

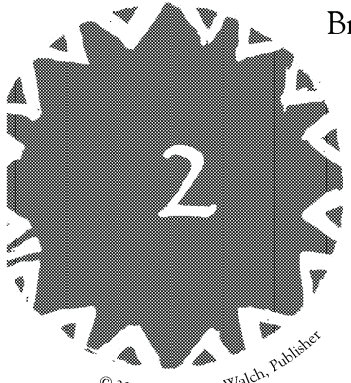
Break a mirror and you'll have seven years of bad luck! Both science and superstition observe events and develop possible explanations for how or why they occurred. The key difference is that only in the **scientific method** is the explanation tested to see if it is true or not.

State a common superstition and then describe an experiment that could be used to prove or disprove its validity.

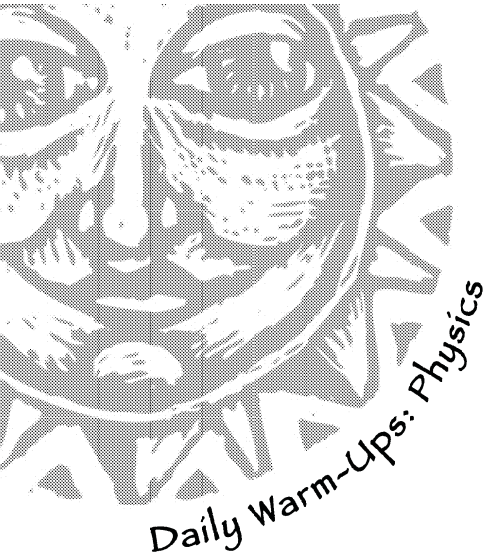


Controversial Theories

In the fourth century B.C.E., Aristotle presented a model of the universe that had Earth at its center with everything else, including the Sun and stars, revolving around it. The model, which was later detailed by Ptolemy, actually worked quite well in explaining the motion of the sun, moon, and planets as viewed from Earth. In 1543, Nicolaus Copernicus published a model of the solar system that had Earth and the other planets revolving around the Sun. Although we now know the latter to be true, it took almost a century to overcome false assumptions and closed minds before it was generally accepted.



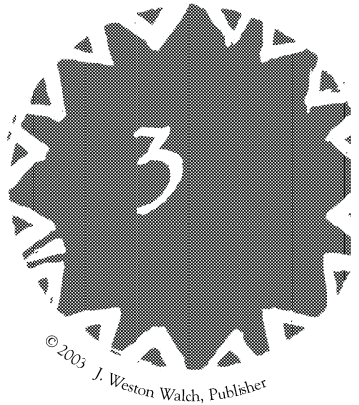
Briefly describe two current scientific theories that are in conflict with each other and give their main points of disagreement.



How Do We Know? 1

We often study scientific facts, laws, and theories as if they were always known to those before us. However, much of what we study is relatively new or revised information. It has been estimated that scientific knowledge has more than doubled in just the past few decades. Most of that knowledge is gained through **research,** which is scientific investigation and inquiry.

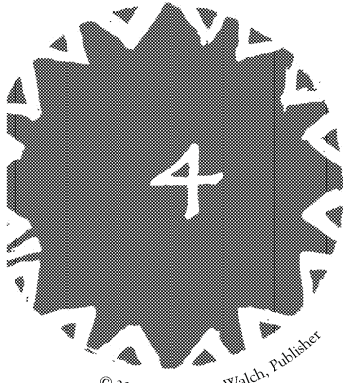
The famous rocket scientist Werhner von Braun once said research is "what I'm doing when I don't know what I'm doing." Write a paragraph explaining what he meant by that statement.



How Do We Know? II

Scientists (and science students) often use the **scientific method** when attempting to determine why something happened in the way it was observed to happen. For any event, several different theories can be offered as possible explanations. In many instances, a well-planned experiment can either prove or disprove the theory. In either case, knowledge has been advanced.

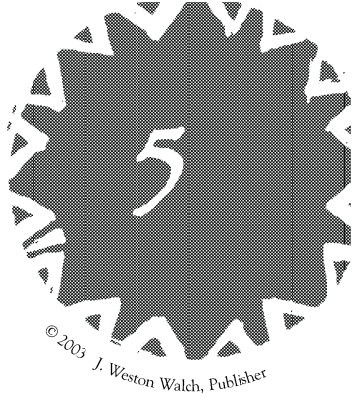
The Greek philosopher Aristotle wrote that "the mark of an educated mind is to be able to entertain a thought without accepting it." Think of a controversial scientific theory and explain why it is important to know what the theory says even if you don't agree with it.



How Do We Know? III

Many breakthroughs in science, such as the discovery of the nucleus, begin with a reconsideration of basic knowledge that leads to technological advances never imagined by its discoverer. Because the outcome of research is often an unknown quantity, there are times when research aimed at gaining new knowledge is controversial. Some people fear that new knowledge may lead to questionable technology.

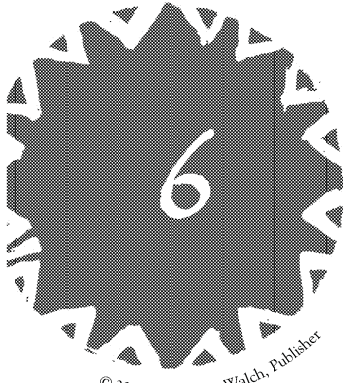
Nobel Prize–winner Marie Curie once said, "Nothing in life is to be feared, only studied." Write a paragraph in which you explain why you agree or disagree with this statement.

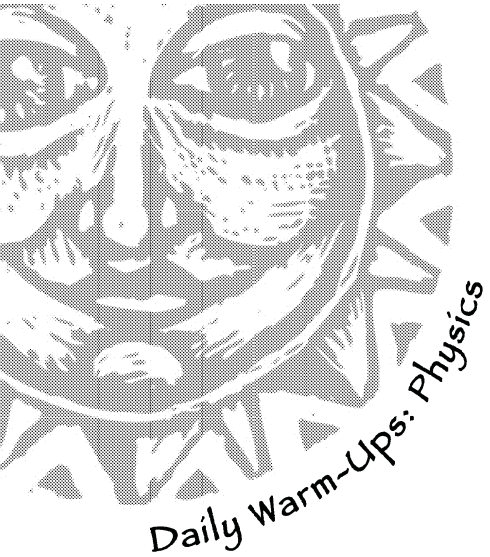


Why Do We Know?

When scientific discovery leads to the invention of products useful to a society, the effects on that society are like the ripples from a stone dropped into the water. Consider for a moment how computers have revolutionized modern life.

The eighteenth-century scientist Michael Faraday made many discoveries in the fields of electricity, magnetism, and chemistry. Faraday was once asked by a minister, "What use is your discovery?" He replied, "One day you will tax it." Write a paragraph explaining what Faraday meant by his statement.



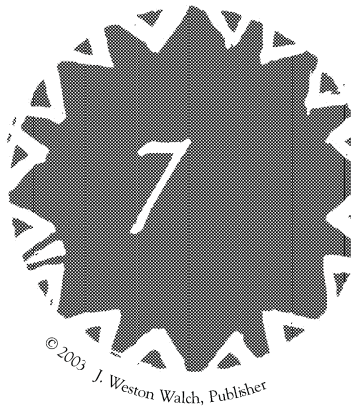


Measure Up!

In science class, we learn the various units of measurement, such as meters (length), grams (mass), and seconds (time). Usually, these are measured in class with rulers, balances, and stopwatches. Similar measurements are made each day at home and at work with instruments that may look different from those you use in school.

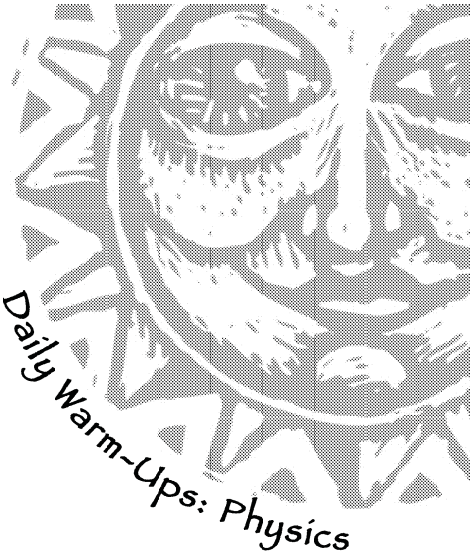
For each situation below, identify a device used to make the measurement.

	Situation	Device Used
1.	a carpenter measuring a wall stud	_____
2.	a cook measuring cooking time	_____
3.	a chemist mixing exact amounts of ingredients	_____
4.	a machinist measuring parts to exact specifications	_____



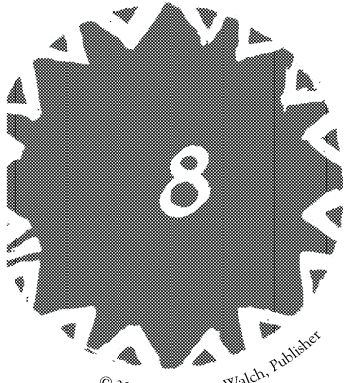
Order in the Court

A skill that many scientists cultivate is the ability to estimate quantities to the correct **order of magnitude.** For example, Ole Roemer, a Danish astronomer, in 1675 became the first person to put the speed of light in the correct order of magnitude (10^8 m/s). This allowed experiments to be designed to measure the speed of light accurately.



Estimate the order of magnitude in meters for each of the following measurements.

1. the diameter of a tennis ball 10____
2. the length of a tennis racket 10____
3. the width of a tennis court 10____
4. the length of a tennis court 10____
5. the height of a tennis net 10____



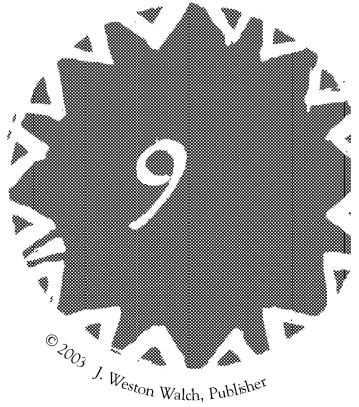
What Size?

Units refer to how much of a given quantity is being measured. Scientists prefer to use the metric system since it is based on units of 10. However, some of the units in the English system are still very much in use in our everyday lives.

Use the list below to match the appropriate units to the quantities. Write the correct unit on the line provided. Some quantities have more than one appropriate unit in the list.

meter	*newton*	*second*	*horsepower*	*pound*
watt	*kilogram*	*ounce*	*mile*	*joule*

	Quantity	Units		Quantity	Units
1.	mass	_____	5.	power	_____
2.	distance	_____	6.	time	_____
3.	energy	_____	7.	work	_____
4.	force	_____	8.	weight	_____

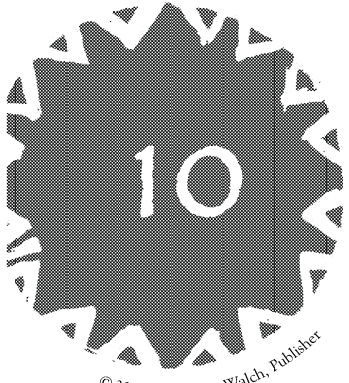


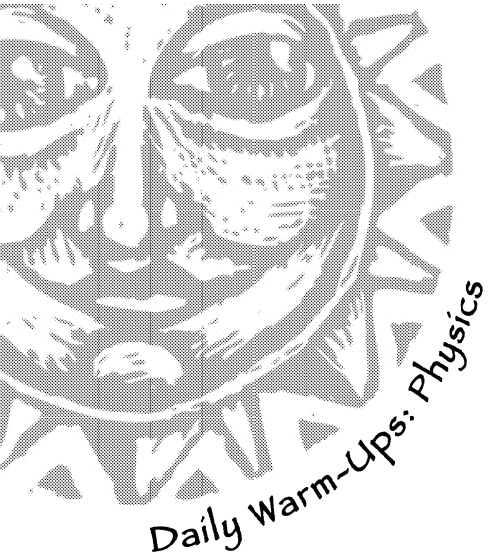
Famous Units

Several units used in science are named after famous physicists whose contributions made them worthy of that honor.

For each of these "famous" units, give the quantity for which it is a measure and a contribution made by the physicist after whom the unit is named.

	Quantity	Famous Unit	Contribution
1.	_____	newton	_____
2.	_____	joule	_____
3.	_____	watt	_____
4.	_____	coulomb	_____
5.	_____	curie	_____





Unit Family Tree

All quantities that are defined in science are measured in given amounts referred to as units. Most quantities are combinations of just three basic quantities and therefore their units are combinations of three basic units. These quantities—**distance, mass,** and **time**—are called the fundamental quantities. In the mks system of measurement, their units are meters, kilograms, and seconds.

For each quantity listed below, the mks unit for that quantity is also given. In the blank to the right, give the formula in meters, kilograms, and seconds that make up that unit. *Hint:* Consider the equation that defines that quantity.

	Quantity	Unit	Formula
1.	force	newton	_____
2.	energy	joule	_____
3.	pressure	pascal	_____
4.	power	watt	_____