Name _____ Class _____ Date _____

SECTION
4-1 What It Means to Do Work

(pages 84–86)

KEY CONCEPTS

▲ A force acting through a distance is work.

■ Building Vocabulary Skills: Understanding Definitions

Decide whether work is being done in each of the following situations. If you think work is being done, write W before the item number. If you think work is not being done, write N.

_____ **1.** You throw a baseball a distance of 20 meters.

_____ **2.** You lift a suitcase to put it in the overhead luggage compartment of a plane.

_____ **3.** You push against a brick wall until you are exhausted.

_____ **4.** You carry a heavy bag of cat litter home from the pet store.

_____ **5.** You slam a tennis ball across the net and score the winning point.

_____ **6.** You study all night for a science test.

_____ **7.** Your finger pushes down the RETURN key on a computer.

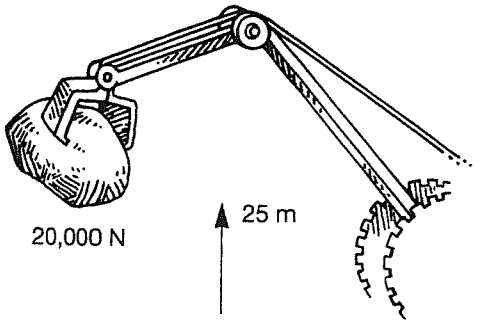
_____ **8.** You move a shovelful of snow from the driveway to the lawn.

_____ **9.** You and a friend push a heavy piano, causing it to move about 10 centimeters.

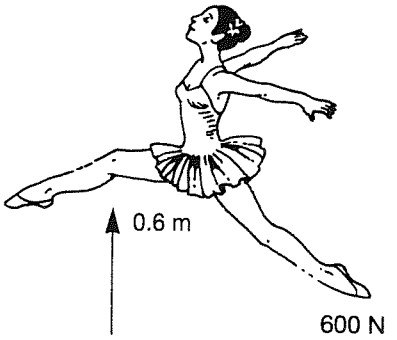
_____ **10.** You stand for half an hour in the freezing cold waiting for the bus to come.

Calculating Work: Applying the Main Ideas

Determine how much work is being done in each situation. Be sure to use the correct unit in your answers. Keep in mind that you might find a situation in which no work is being done.



1. _____



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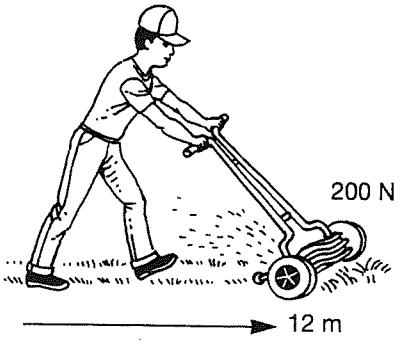
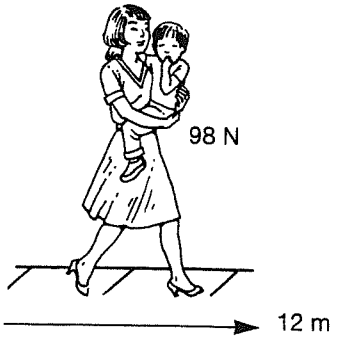


3. _____



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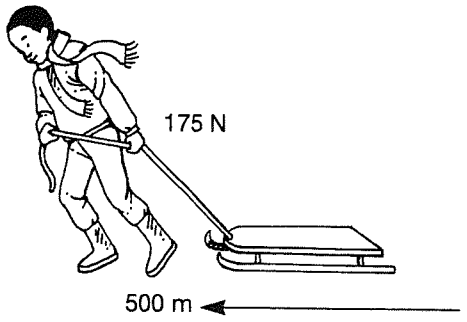

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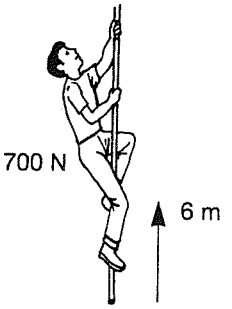

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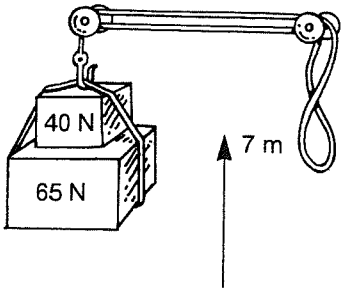

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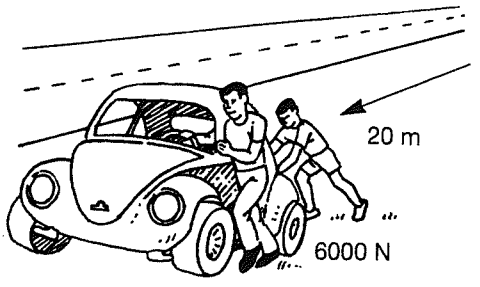


8. _____

Name _____ Class _____ Date _____

SECTION
4-2 Power

(pages 86–88)

KEY CONCEPTS

▲ Power is the rate at which work is done, or the amount of work per unit of time.

Building Vocabulary Skills: Fill in the Blanks

From the terms listed below, choose the term or terms that best complete each sentence. You will use some terms more than once.

force	distance	work	power
joule	watt	time	rate

1. A 100-watt light bulb has more _____ than a 60-watt light bulb.
2. Power is the amount of _____ per unit of time.
3. The unit of power is equal to one _____ per second.
4. _____ is the rate at which work is done.
5. Electrical appliances are rated in _____.
6. Power can be calculated by multiplying force x distance and dividing by _____.
7. When the _____ of doing work increases, power increases.
8. A 150-watt bulb does 150 _____ of work.
9. A 500-watt machine can do more _____ in the same amount of time than a 300-watt machine can.
10. If time and force remain the same, power is increased when the _____ increases.

Calculating Power: Using the Main Ideas

Complete the chart below by filling in the missing quantities.

Force (N)	Distance (m)	Time (s)	Work (J)	Power (W)
10	6	4		
	4	5		50
30			600	300
500	10			100
	16	8	64	
100	0.5			25
200		2	100	
	50	30	1500	
800	100			4000

Name _____ Class _____ Date _____

SECTION
4-3 Machines

(pages 89–92)

KEY CONCEPTS

- Machines make work easier because they change either the size or the direction of the force put into the machine.

Building Vocabulary Skills: Relating Terms

Tell how the terms in each pair are related.

1. machine: work

_____

_____

2. work input: effort force

_____

_____

3. mechanical advantage: effort force

_____

_____

4. work input: work output

_____

_____

5. efficiency: work output

_____

_____

6. work output: resistance force

_____

_____

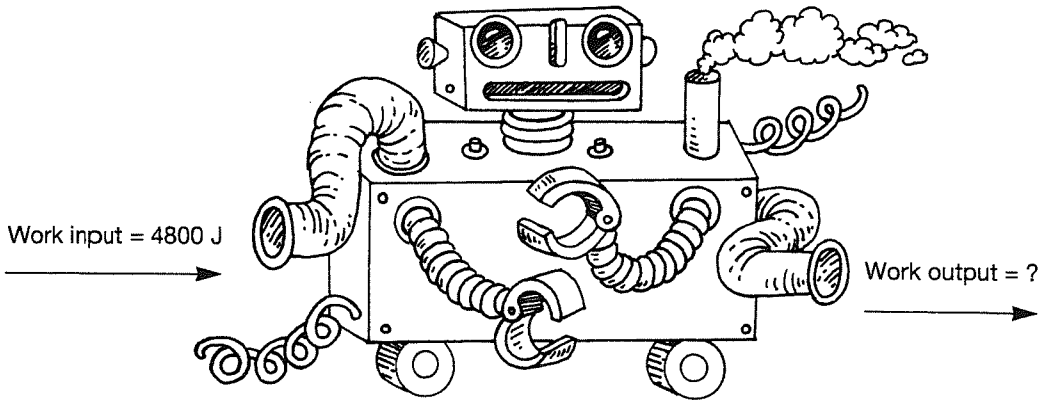
Helpful Machines: Understanding the Main Ideas

1. A 100-N effort force applied to a machine lifts a 400-N object. What is the mechanical advantage of this machine?

_____

2. If the machine shown in Figure 1 is 75 percent efficient, what is the work output?

_____



3. A machine moves a 600-kg object 6 meters. If the amount of work put into the machine is 4500 joules, what is the efficiency of the machine?

_____

4. A machine has a mechanical advantage of 3. If a 200-N force is applied to the machine, how much force will the machine produce?

_____

5. A machine used to lift crates of oranges has an efficiency of 65 percent. If a crate of oranges weighing 1300 N is lifted 50 meters, how much work must be put into the machine?

_____

Name _____ Class _____ Date _____

SECTION
4-4 Simple and Compound Machines

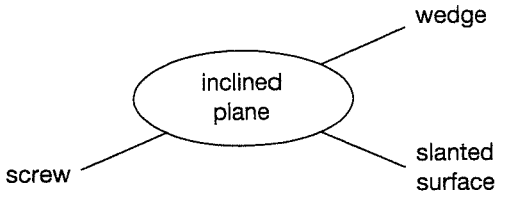
(pages 92–101)

KEY CONCEPTS

- There are six types of simple machines: the inclined plane, the wedge, the screw, the lever, the pulley, and the wheel and axle.
- A compound machine is a combination of two or more simple machines.

Building Vocabulary Skills: Machine Talk

For each item, tell how the term in the circle is related to the terms around it.



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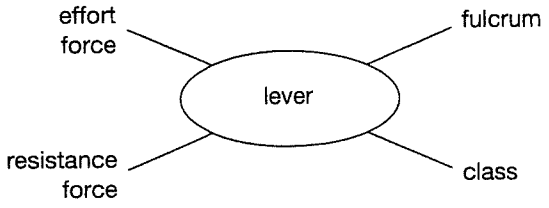

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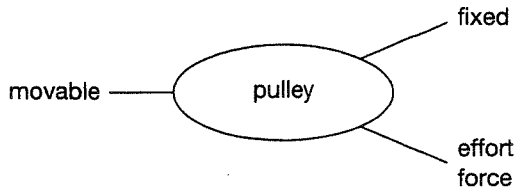
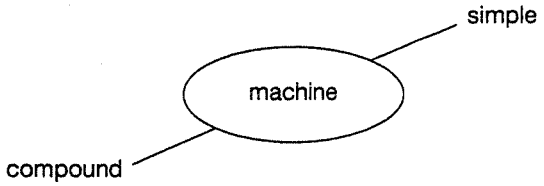

fixed
movable
pulley
effort
force

3. _____

_____

_____

_____

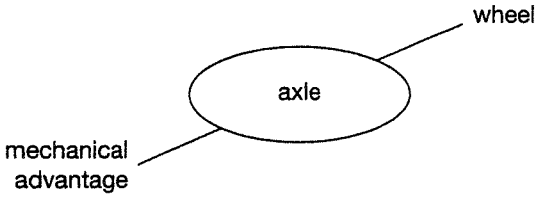

simple
machine
compound

4. _____

_____

_____

_____


wheel
axle
mechanical
advantage

5. _____

_____

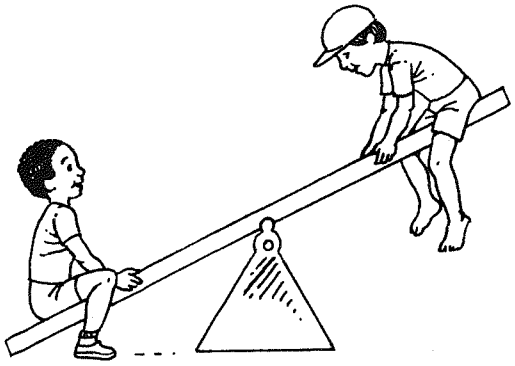
_____

_____

Name _____ Class _____ Date _____

Identifying Simple Machines: Understanding the Main Ideas

Each item pictured below is a type of simple machine. For each item, identify the simple machine.



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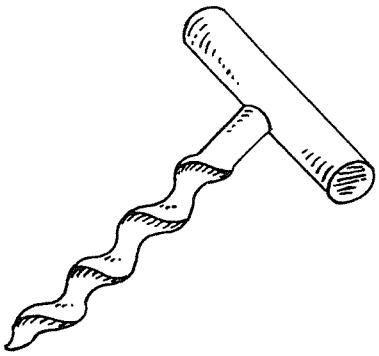

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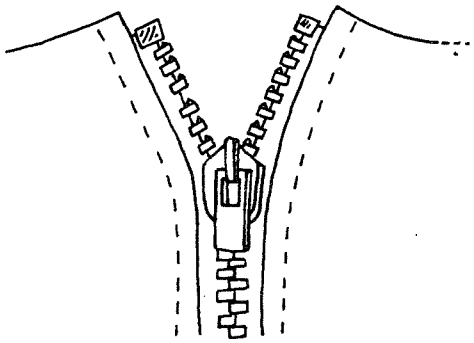

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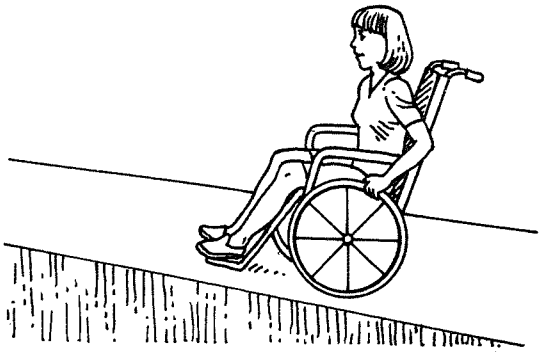

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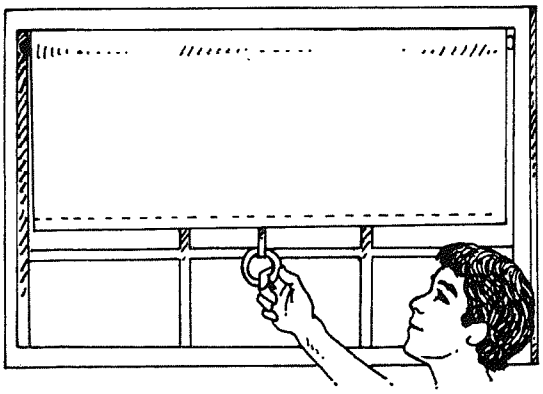

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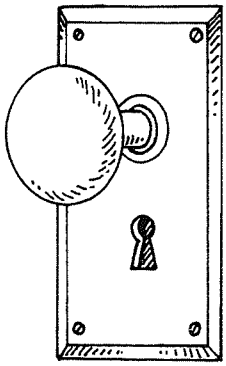

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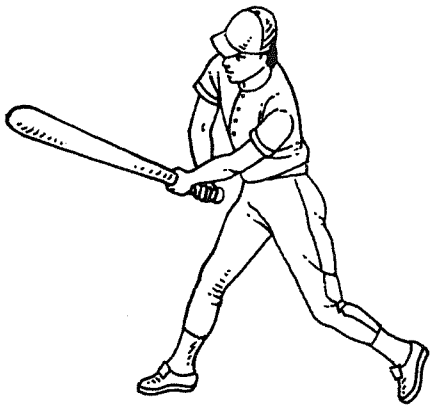
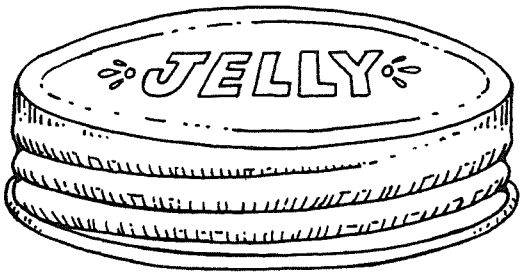
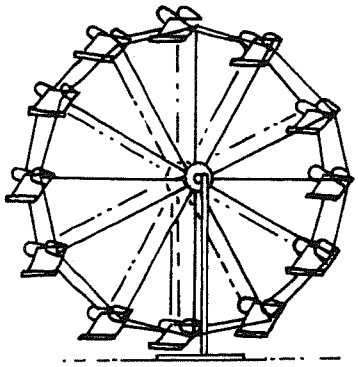
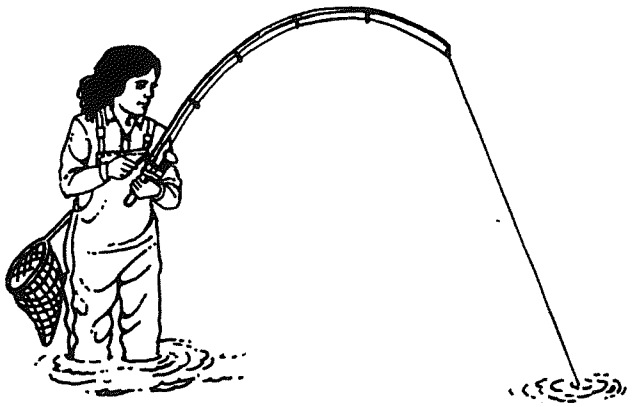




7. _____

8. _____





9. _____

10. _____

Classifying Levers

On each diagram, correctly place the effort, fulcrum, and resistance to show the kind of lever indicated. Use the following symbols:

Effort: ↓ or ↑ Fulcrum: ▲ Resistance: ■

1st Class	2nd Class
_____	_____

3rd Class
_____