What Is This Module About?

Human strength alone is not enough to do most of the work in a day, at any given day. Can you imagine how the Pyramids of Egypt or The Great Wall of China were constructed? Remember that there was no heavy equipment available at that time. So how were the early people able to build these huge landmarks?

Simple machines have helped thousands of muscled and well-built people construct these world famous and huge landmarks. The concept of simple machines has enabled people throughout the ages to accomplish what were deemed as impossible then.

You may be surprised to find out that the use of simple machines goes as far back as the ancient times. Simple machines served as practical solutions to our ancestors' daily ordeals. Moving of a load from one place to another, for example, may have prompted the earliest men to think of a device that could do such a task with less difficulty.

Man's physical strength can only go as far as it can. It can never do everything, but with simple machines man can now accomplish tasks that would have been difficult or impossible if he used his own strength alone.

In this module, you will learn more about simple machines.

This module is divided into two lessons:

Lesson 1 – *Introducing…The Simple Machines*

Lesson 2 – *The Uses of Simple Machines*

What Will You Learn From This Module?

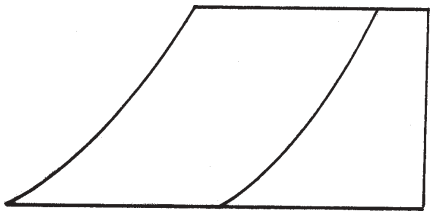
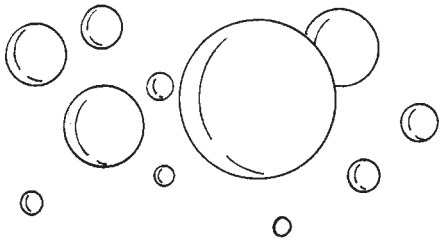
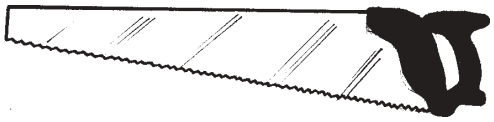
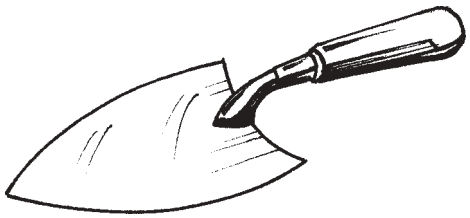
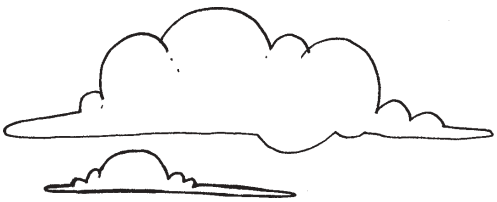
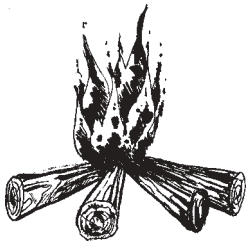
After studying this module, you should be able to:

- define the following terms: *work, force* and *simple machine;*
- identify the six classifications of simple machines;
- explain how each simple machine helps do the work; and
- give examples of simple machines.

Let's See What You Already Know

Before you start studying the module, try to do the exercises that follow to determine how familiar you are with this topic. You don't have to worry if you are not able to perform the exercises correctly.

A. Put a check mark (4) beside the object that is an example of a simple machine and an X-mark (6) if the object is not an example of a simple machine.

 ramp	 bubbles
 saw	 wheelbarrow
 flower	 shovel
 clouds	 fork
 burning fire	 hatchet

B. Fill in the blanks. Write your answers on the blank spaces provided.

1. _____ are tools that made the necessary work for survival easier.

2. There are six classifications of simple machines, namely: _____, _____, _____, _____, _____, and _____.

3. Of the six simple machines, the three main classifications are: _____, _____, and _____.

4. A bicycle is an example of a simple machine classified as _____.

5. _____ takes place when a force moves an object.

6. When something is moved and _____ is used, then there is work.

7. A pair of scissors is an example of two simple machines, namely: _____ and _____.

8. If no _____ has been obtained or covered, no work is being done.

9. An elevator, a flagpole and a Venetian blind make use of the _____.

10. The _____ is actually two inclined planes joined back to back.

Well, how was it? Do you think you fared well? Compare your answers with those in the *Answer Key* on pages 42–43 to find out.

If all your answers are correct, very good! You may still study the module to review what you already know. Who knows, you might learn a few more new things as well.

If you got a low score, don't feel bad. This only goes to show that this module is for you. It will help you understand some important concepts that you can apply in your daily life. If you study this module carefully, you will learn the answers to all the items in the test and a lot more! Are you ready?

You may now go to the next page to begin Lesson 1.

LESSON 1

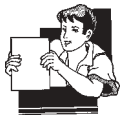
Introducing…The Simple Machines

Have you ever wondered how the things around us work? With a little help from machines, almost all tasks you can think of are done with much ease and convenience in less time.

Simple machines are simple tools used to make work easier for us. Look around—can you identify these simple machines? You'll be surprised to find out how simple machines are commonly used in our everyday tasks or work. Machines used in many industries are combinations of simple machines.

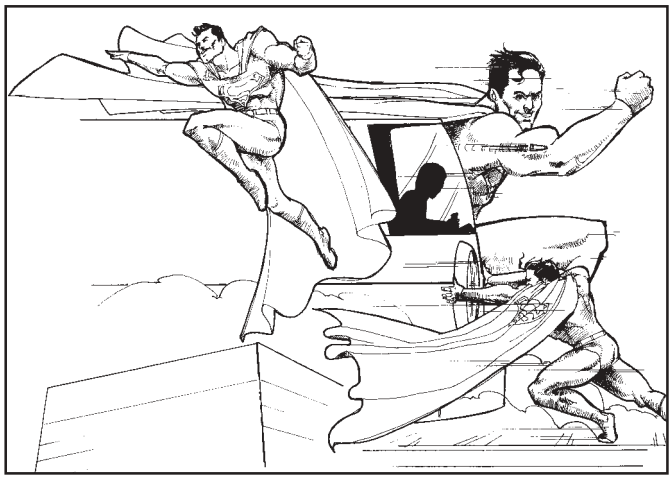
After studying this lesson, you should be able to:

- define the following terms: *work, force* and *simple machine;*
- identify the six classifications of a simple machine; and
- give examples of each simple machine.

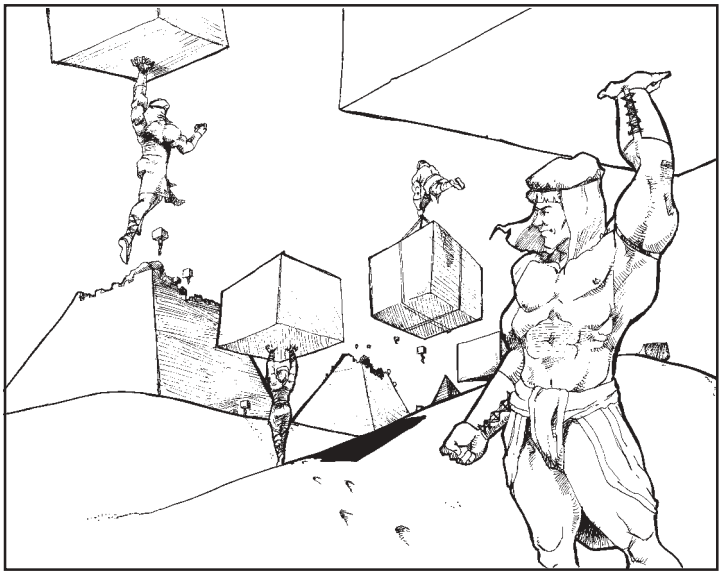


Let's Learn

Look at the picture. Can you recognize this man? If you say he is Superman, you are right! Superman is a comic book hero with superhuman strength. He can leap over tall buildings in a single bound, and is more powerful than a train and faster than a speeding bullet.



Unfortunately, no human being comes close to Superman's incredible strength and power. Can you imagine if all of us were as strong as Superman? Landmarks such as the Pyramids of Egypt and the Great Wall of China would not have taken years to build—it would have taken days, if not just hours.



In a way, simple machines have taken the place of Superman. It's a fact: there is no one as strong as Superman, there's no one who can lift a car. But a simple machine can do such tasks for us. Simple machines allow us to apply a small or weak force to produce or overcome a stronger force.

Let's Study and Analyze

Simple machines are not meant to replace or to eliminate work; they just provide us with an advantage that makes work easier and faster. Let's look at the pictures below.

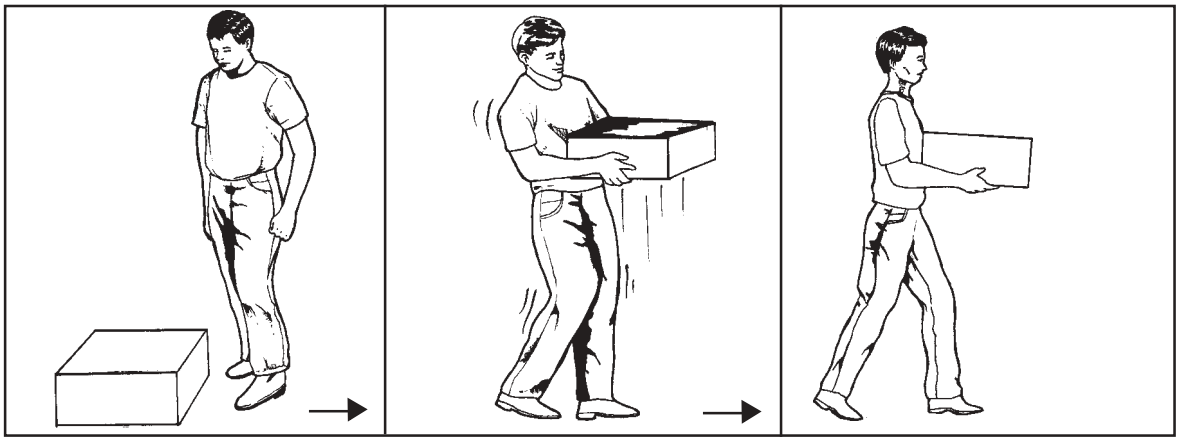


Figure 1 Figure 2 Figure 3

What do you see from the three figures? Describe each.

_____
_____
_____
_____
_____
_____

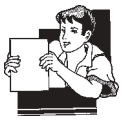
Compare your answers with those in the *Answer Key* on page 43.

What is work, anyway? **Work** is defined as force moving an object over a distance. Which figure shows that work has taken place? If you say Figure 3, your answer is correct.

Now, what is force? **Force** is anything that causes or changes motion in a body. Pushing, pulling, stretching, squeezing, bending and falling are examples of how force is applied. So looking at Figure 2, we can see that the man lifting the box from the floor upwards means that force was applied.

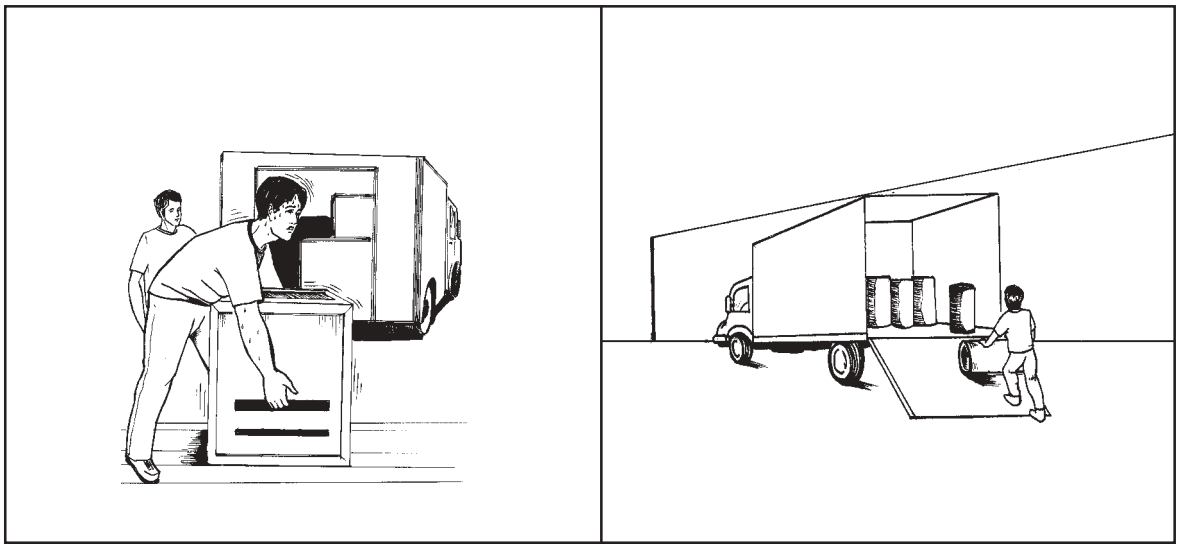
What if someone is attempting to lift an object but fails? Isn't the effort of lifting the object considered as work? What do you think?

Aside from relying on force, another consideration for anything to be called work is that it has to cover distance.



Let's Learn

Take a look at the pictures below. Which picture do you think shows work being done?



If you say the man on the right was doing work, you are right! But why is that? Explain in your own words. _____

_____

_____

_____

Were you able to answer the question? Below, you'll find possible answers to the question.

The man on the left attempted to lift the heavy box. Although he may have been exerting much effort, this does not count as work.

The man on the right, on the other hand, obviously did some work. He was able to bring the barrel into the van. Let's check. There is movement as he was able to roll the barrel from where it was at first and then into the van by using a ramp. A distance has been covered as barrel was brought from one point to another.

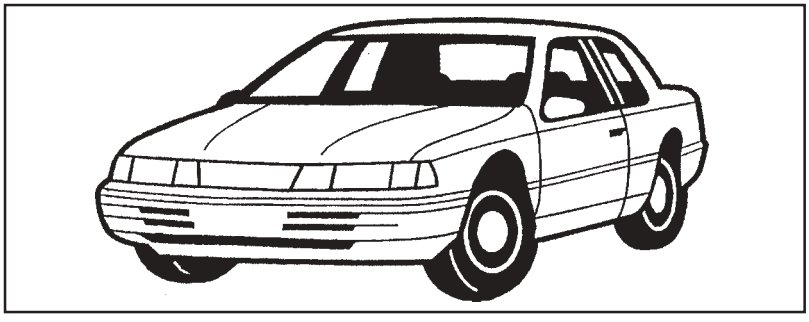
To determine if there's actual work, scientists came up with a formula: Work = Force x Distance. Or if you don't feel that computing is time consuming, then just remember the two conditions that will determine if work is being done:

- Something has to move.
- The motion must be in the direction of the applied force.

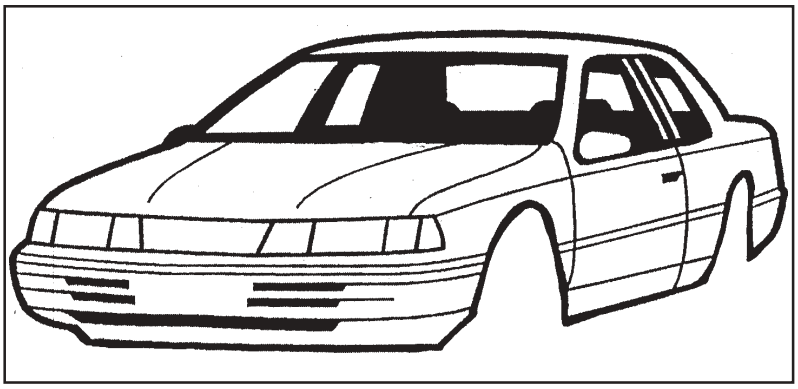
Let's Think About This

Have you ever thought how life would be if there were no simple machines to begin with? Can you think of things that you see around that have wheels on them?

A. Let's look at a car.



Now, imagine it without wheels. Can you see it moving without its wheels?



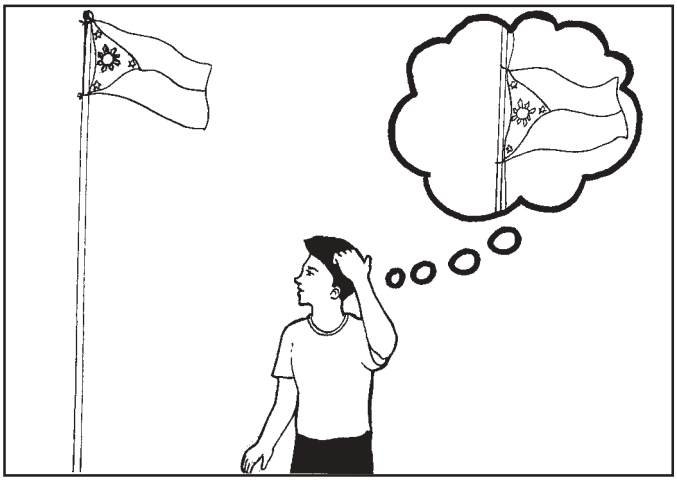
_____

_____

_____

_____

B. What about a flag on a pole—how do you think it got up there?



_____

_____

_____

_____

C. How do you think our mothers would have prepared our food if not for knives or peelers? Will doctors be able to perform operations using their bare hands? Will travelling be possible without machines?

_____

_____

_____

_____

You may compare your answers with those in the *Answer Key* on pages 43–44.

Obviously, almost all the things that you can think of have a simple machine or a combination of simple machines built into it. As mentioned earlier, simple machines are tools that allow work to be done easier and faster.

Let's Think About This

Look around your home, school or neighborhood. Take note of the machines that you see. List down all the things that you think are examples of a simple machine or a combination of simple machines.

Home:

1. _____
2. _____
3. _____
4. _____
5. _____

School:

1. _____

2. _____

3. _____

4. _____

5. _____

Neighborhood:

1. _____

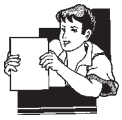
2. _____

3. _____

4. _____

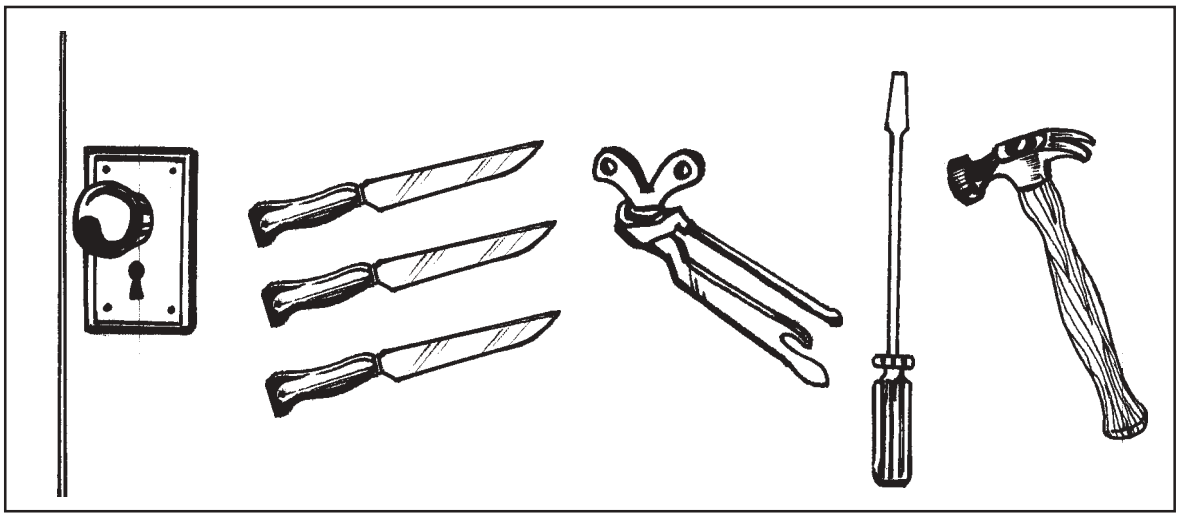
5. _____

Compare your answers with those in the *Answer Key* on page 44.

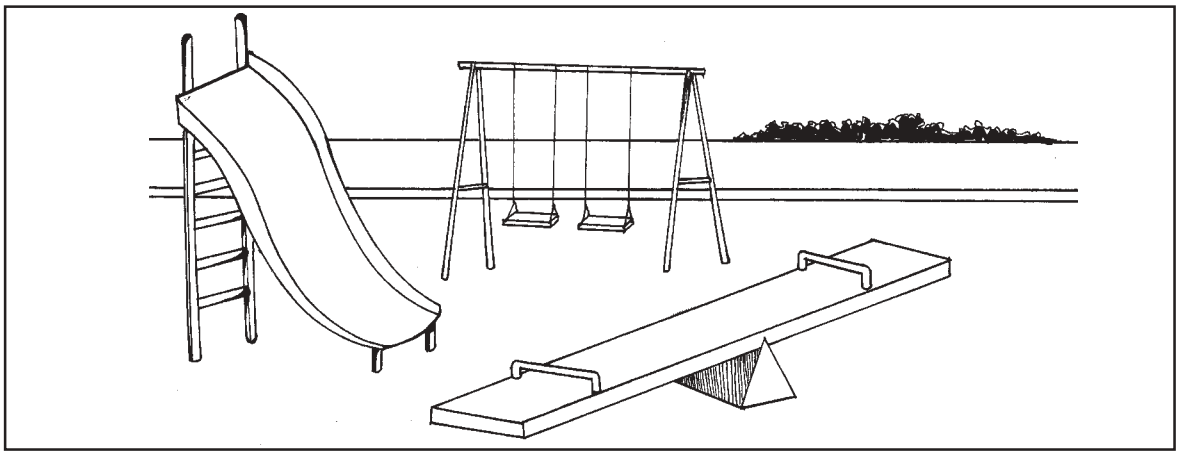


Let's Learn

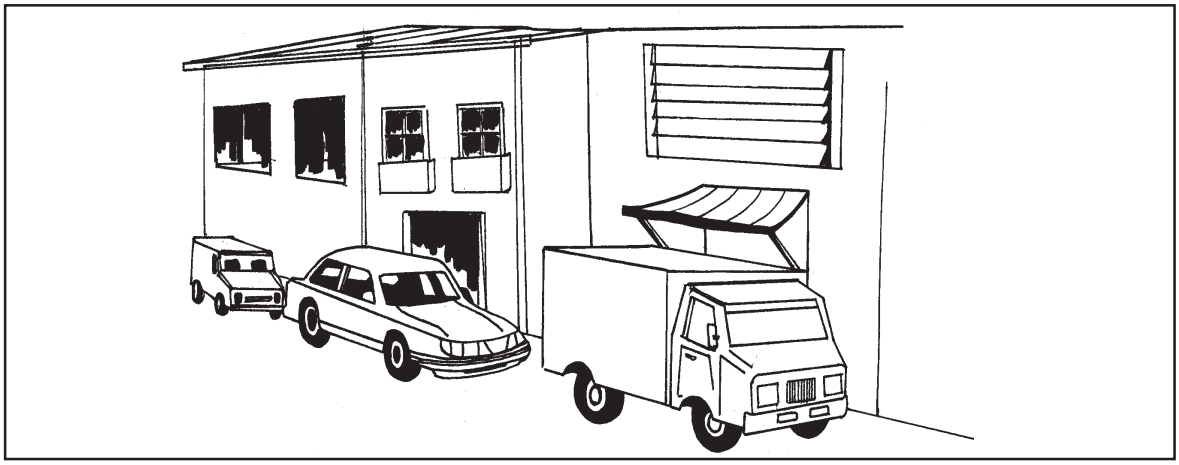
At home, the most common simple machines are the doorknob, knives, can openers, screwdriver and hammer.



In school, you can just look at the playground where the slide and the seesaw can be cited as good examples of simple machines.



In your neighborhood, you'll see bicycles, tricycles, cars and trucks.



Aren't simple machines great? Without simple machines and their eventual transformation to more complex machines, do you think we can still do the things that we can do now? Write down your thoughts about a world without machines.

_____

_____

_____

_____

_____

_____

Compare your answers with those in the *Answer Key* on page 44.

Remember that simple machines will help us do the same amount of work but with less effort and time. Are you ready to learn more about each of these simple machines? If so, read on.

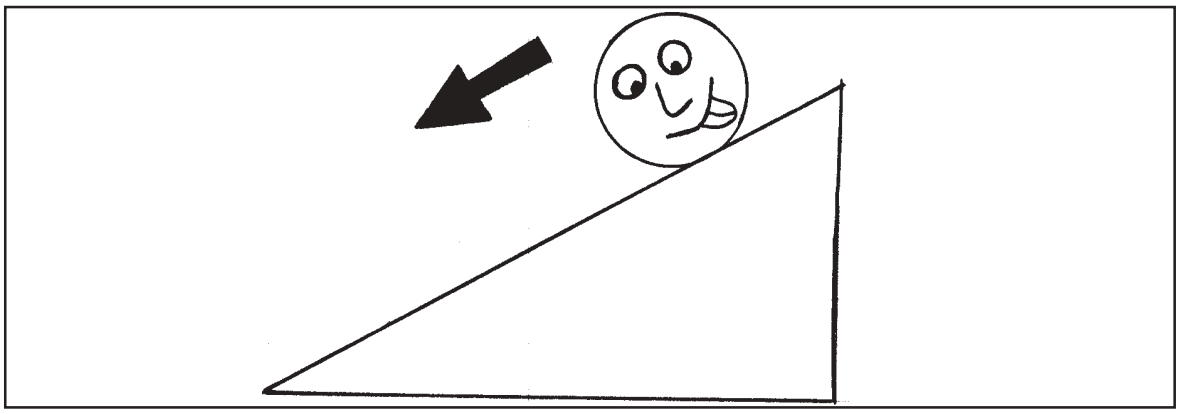
Let's Study And Analyze

There are six simple machines, namely: the lever, the pulley, the inclined plane, the wheel and axle, the wedge, and the screw.

The lever, the pulley and inclined plane are considered to be the main classifications of simple machines. The three remaining ones (wheel and axle, wedge and screw) are considered modifications of the first three simple machines.

The Inclined Plane

An **inclined plane** is a slanting or sloping surface that connects a lower level to a higher level. An inclined plane can sometimes be referred to as a ramp. Let's look at the picture below.



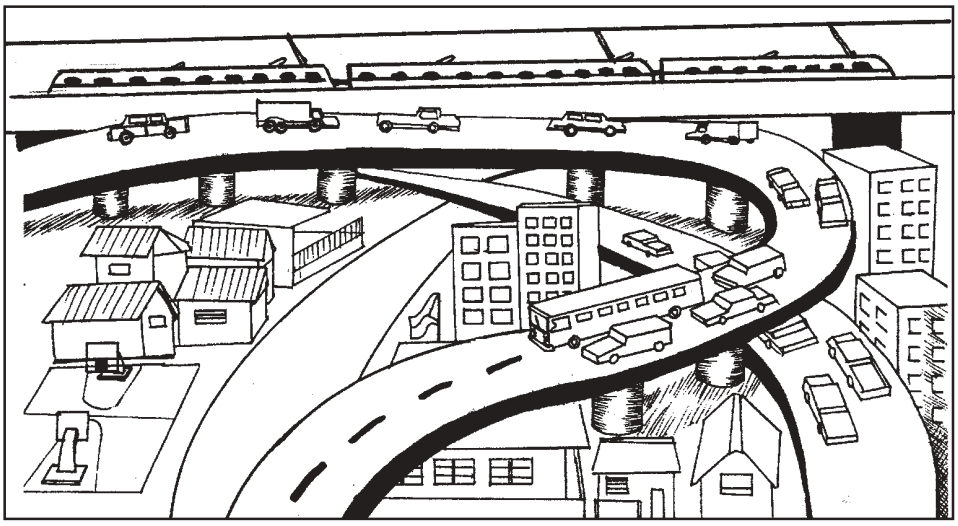
Does the inclined plane look familiar? Can you think of anything around you that may be similar to this simple machine? List them below.

_____

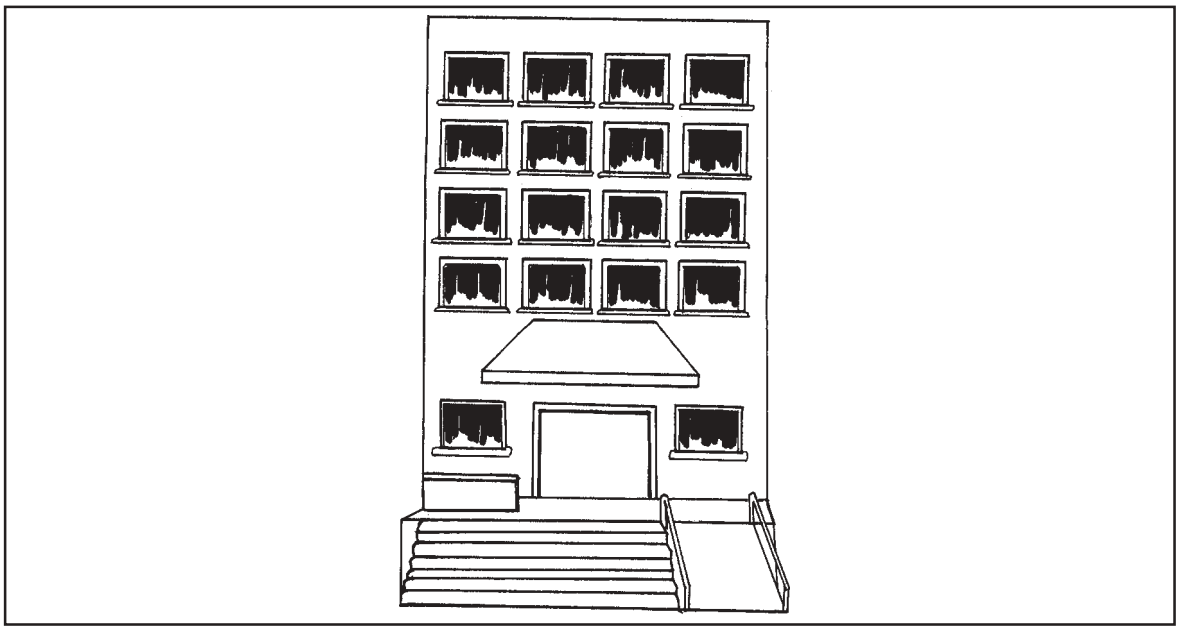
_____

You may compare your answer with the one in the *Answer Key* on page 45.

Here's another one. Have you seen the flyovers along the highways of EDSA? These flyovers allow cars to go from one level to another level of the road or to go from one direction to another.



Another example would be the ramps found in entrances and exits of most public buildings. These ramps are provided for our physically challenged brothers and sisters on wheelchairs or crutches. Since they cannot climb up the stairs on their own, ramps allow them to use their wheelchairs so that they could have easy access to buildings or offices.



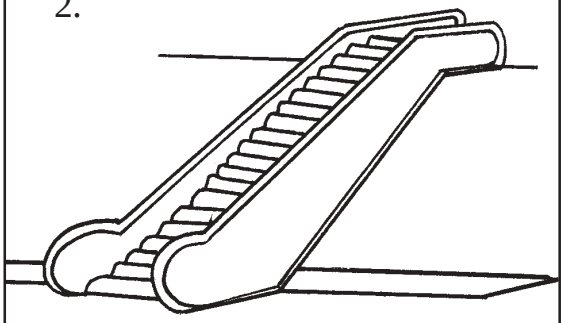
Let's Try This

Identify the following examples of an inclined plane. Write your answers in the blanks below each picture.

1.

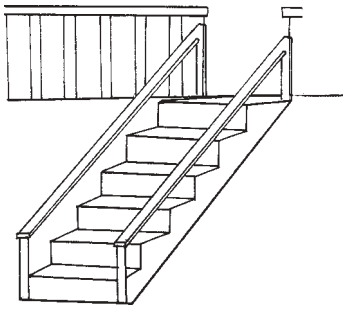
_____

2.



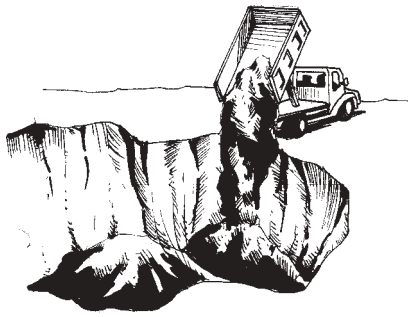
_____

3.



_____

4.



_____

5.

_____

Note: You may have a hard time with Item 5. Here's a clue. Guess the missing word in this nursery rhyme.

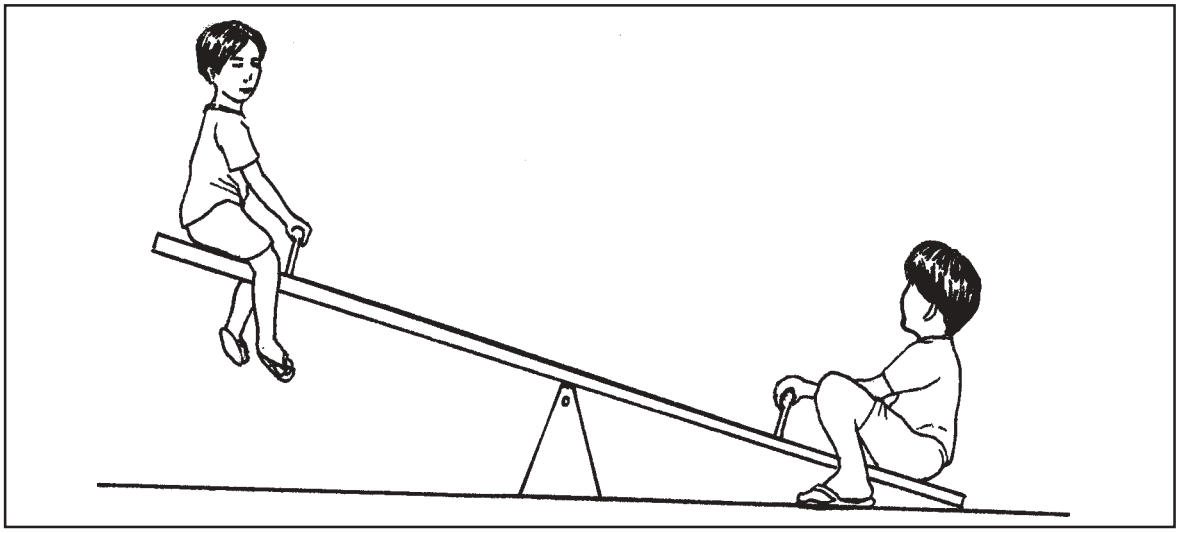
Jack and Jill went up the _____ to fetch a pail of water …

Compare your answers with those in the *Answer Key* on page 45.

Let's Study and Analyze

The Lever

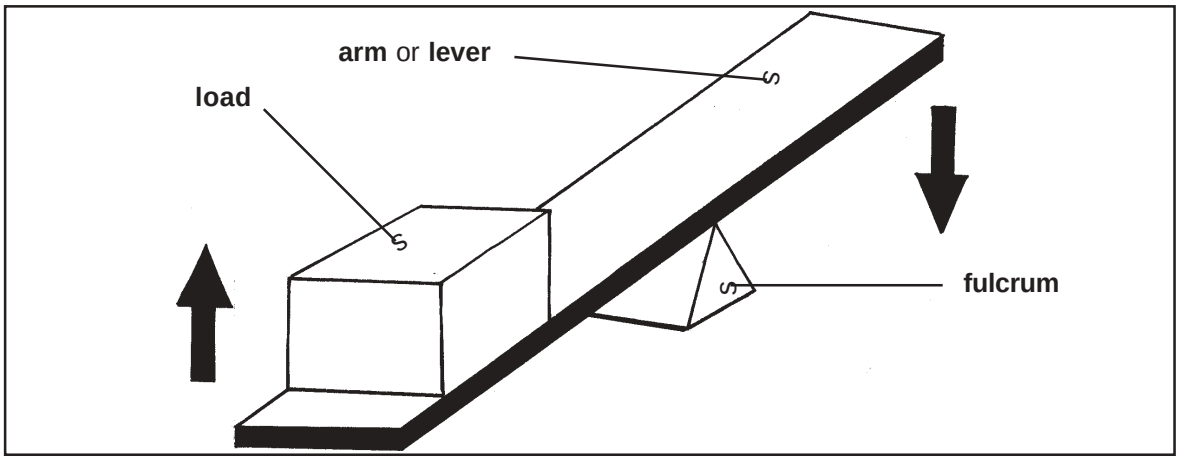
The **lever** is a simple machine made up of a bar or an arm that turns or lifts against a "fulcrum" or support. To better picture what this simple machine is like, let's look at the illustration below.



The seesaw, just like any other lever, consists of four parts: the **arm** or the **lever** itself. The **fulcrum** is the central point that the arm rocks on. It is the thing that makes the load a little lighter for us. The **load** is the object you are trying to move or lift. The **force** is the spot where the effort to move the load is to be applied.

Looking at the seesaw, can you pinpoint where the arm, fulcrum, load and forces are found?

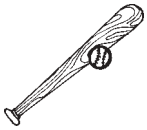
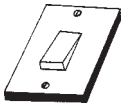
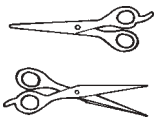
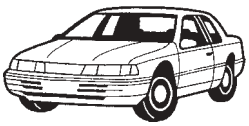
The part you sit on a seesaw is the arm. The brace in the middle is the fulcrum. The two children sitting at each end alternately take turns being the load and being the force.



There are three classifications of levers, namely: the First Class Lever, Second Class Lever and Third Class Lever. Each class of lever is determined by where the load is in relation to the fulcrum. You will know more about this in the next lesson.

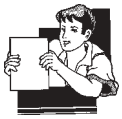
Let's Try This

Based on your understanding of a lever, can you now identify which of the pictures below is a lever? Well, let's find out. Put an X-mark (6) on the drawing or illustration that you think is not a lever.

1. oar 
2. baseball bat 
3. fork 
4. light switch 
5. pair of scissors 
6. car 
7. ruler 
8. eraser 

9. spoon 
10. hat 

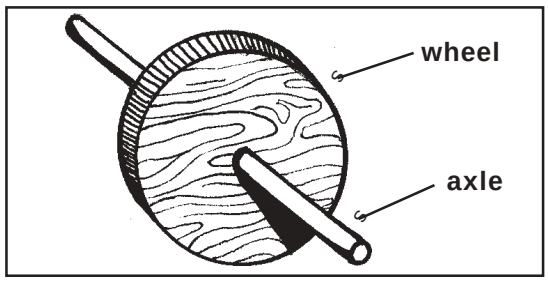
Compare your answer with those in the *Answer Key* on page 45.



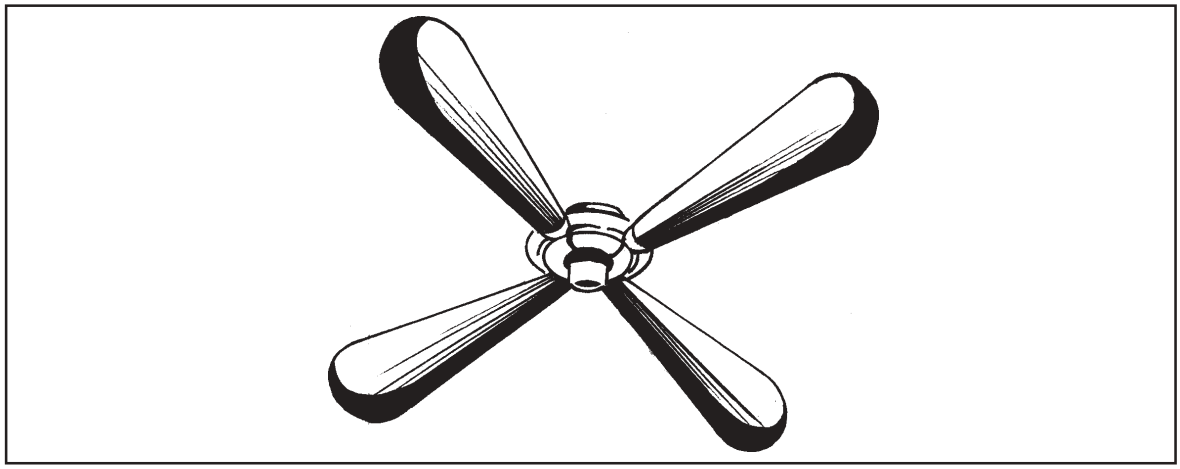
Let's Learn

The Wheel and Axle

The **wheel and the axle** is a very popular simple machine. It is made up of a few objects. On the illustration below, we can see that the wheel, the bigger round object, turns the axle, the smaller cylindrical object similar to a stick.

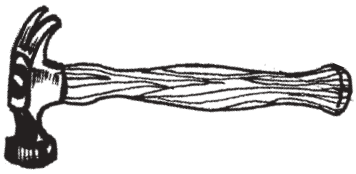
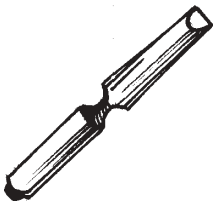
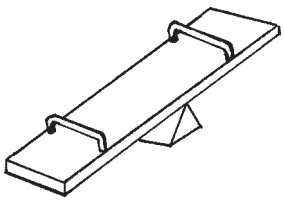


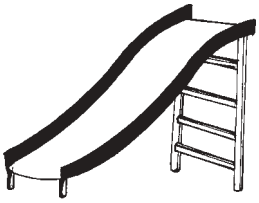
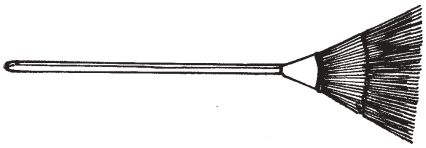
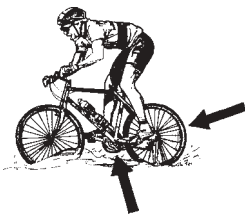
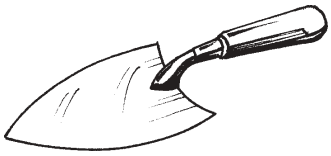
A classic example would be a ceiling fan. Have you seen a ceiling fan lately? The small rod which is the **axle** is stuck firmly to a wheel, represented by the fan blades. And so when ceiling fan is turned on, the axle turns making the wheel (fan blades) turn also.



Let's Try This

Look at the pictures or illustrations below. Identify whether the object is an *inclined plane*, *lever*, or *wheel and axle.* Choose and write your answers on the spaces provided below the table (on the next page).

1.  **hammer**	2.  **door knob**
3.  **chisel**	4.  **screwdriver**
5.  **hatchet**	6.  **Seesaw on the playground**

7.  slide on the playground	8.  broom
9.  bicycle	10.  shovel

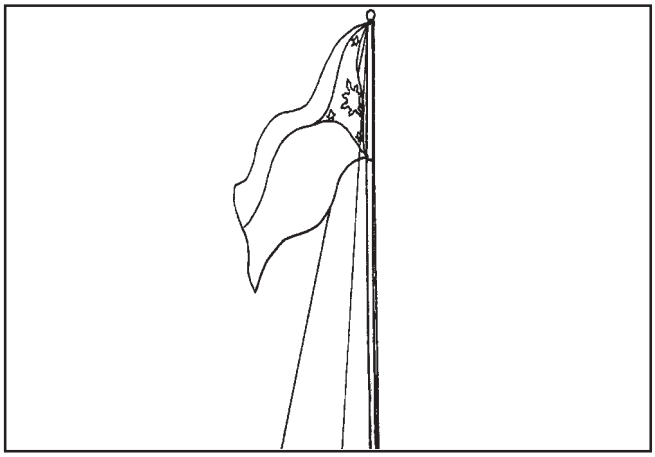
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Compare your answers with those in the *Answer Key* on page 46.

Aren't simple machines just useful and amazing? They are everywhere and they play significant roles in our everyday lives!

Let's Think About This

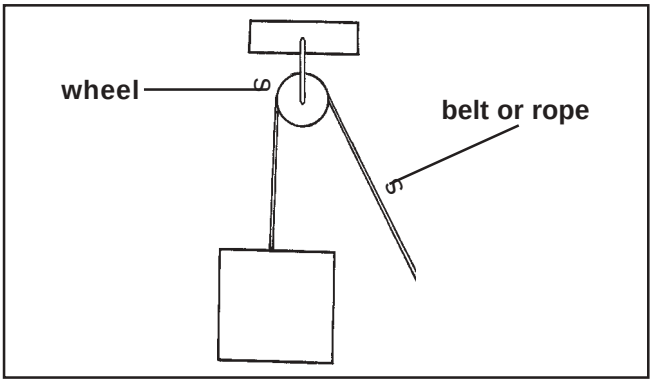
Look at the picture below.



Can you guess the simple machine shown here? If you're thinking of the pulley, you are right again! Let's now study this simple machine.

The Pulley

The **pulley** is a simple machine that uses a rope, belt or chain wrapped around a wheel. What does a pulley look like? Let's look at the picture below.

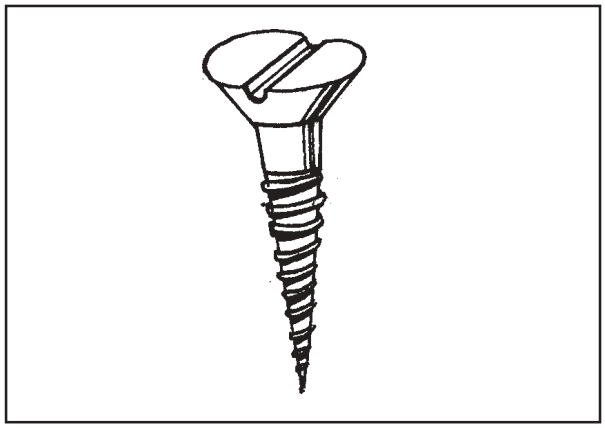


Basically, the set-up for a pulley is that the machine or person is on one side while an object is on the other. The person or machine pulls the rope down to lift the object. To make the object go down, the machine or person lets go of the rope.

More about pulleys will be discussed in the next lesson.

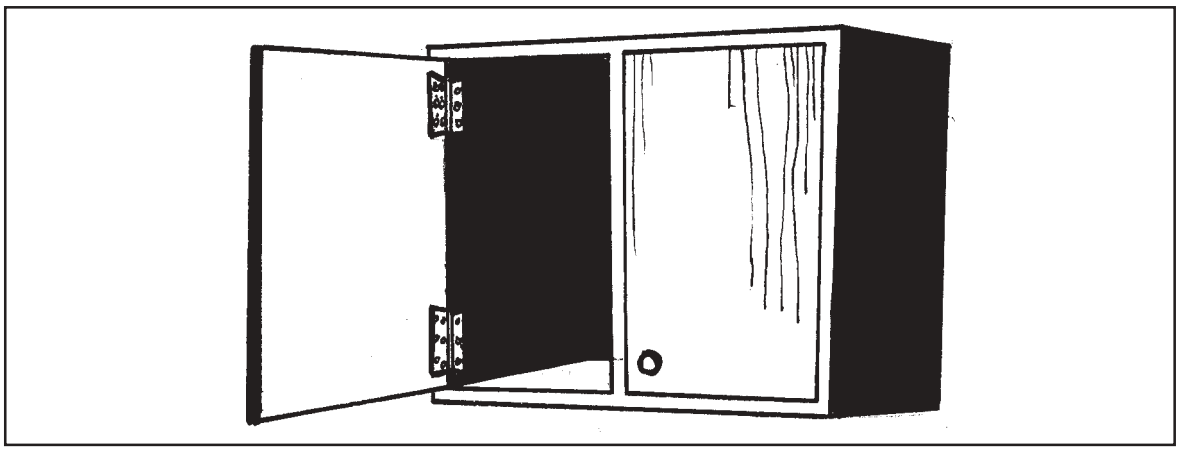
Let's Think About This

What simple machine do you think this is? And what do you think this simple machine does?

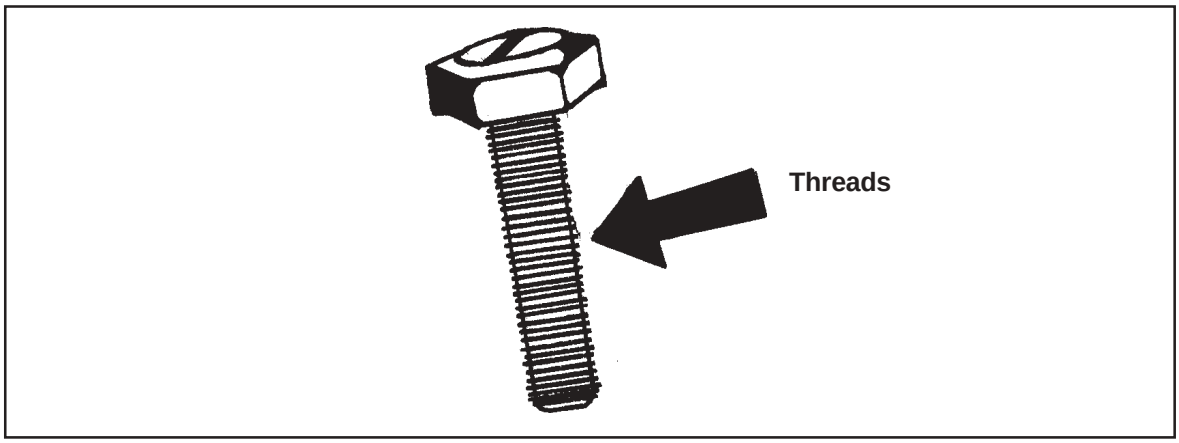


If you guessed ***screw,*** then you are right.

A **screw** is a very useful tool. It is a simple machine which is equivalent to the spiral form of an inclined plane. It is the screw that holds in place the hinges in your cabinet doors. Look at the picture below.

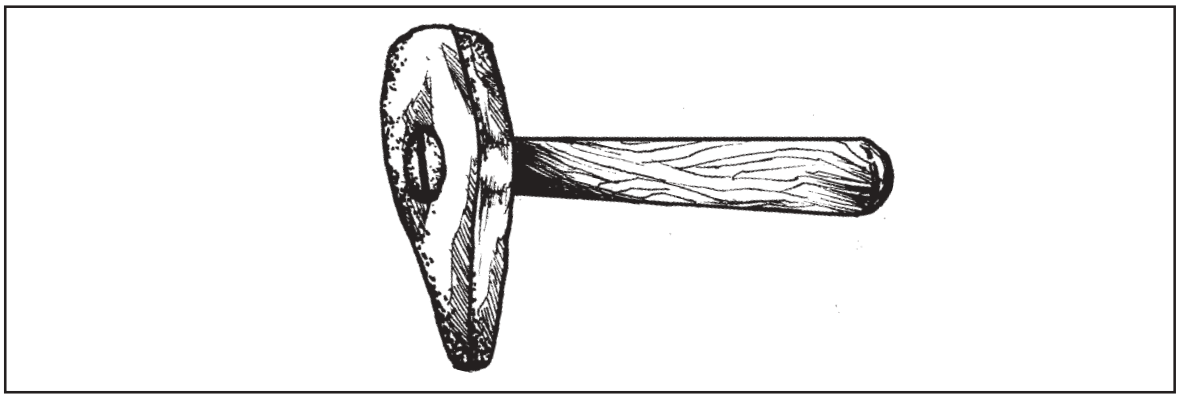


For easy identification of a screw every time you see one, think about anything that has threads. Yes, you read it right: threads. Look closely at the illustration below.



What do the threads remind you of? If you're thinking of the inclined plane, you're right! The **threads** are like small ramps around a screw.

What about this simple machine, can you guess this one?



If you're thinking of a ***wedge,*** then you're right again.

A **wedge** is a simple machine with at least one slanting side ending in a sharp edge. Are you familiar with the story of Little Red Riding Hood? The woodcutter's ax (or any ax at all) used to kill the bad wolf is an example of a wedge.

Can you think of examples of a wedge? Think of objects that have sharp edges. Discuss it with your Instructional Manager for feedback.

Let's See What You Have Learned

A. Answer the following questions.

1. Why are simple machines important? Cite everyday activities where simple machines are used.

_____
_____
_____
_____
_____

2. In your opinion, which is the most "hardworking" or "dependable" simple machine? Why?

_____
_____
_____
_____
_____

3. What are the most commonly seen simple machines in your home? Give examples of these simple machines found in your home.

_____
_____
_____
_____
_____

4. Of the six simple machines, the lever, the pulley and the inclined plane are considered to be the main classifications of simple machines. Why do you think is this so?

_____
_____
_____
_____
_____

5. Knowing the nature of simple machines, would you consider some parts of the human body as simple machines? Why or why not? Also, give examples of parts of the human body that you think are similar to simple machines.

_____
_____
_____
_____
_____

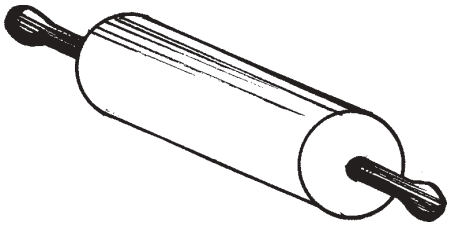
B. Identify the simple machine used in each illustration. Write your answers below each illustration.

1.

Spiraling roads leading to Baguio

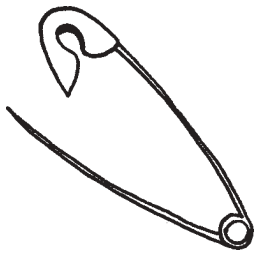
_____

2.



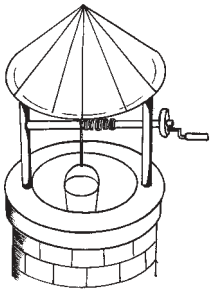
Rolling pin

3.



Safety pin

4.

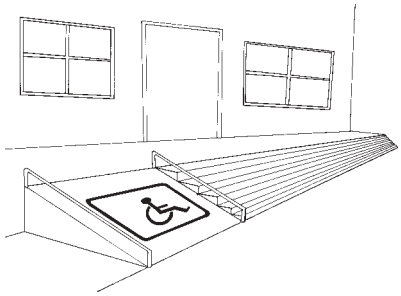


Old-fashioned well

5.

Jar lid

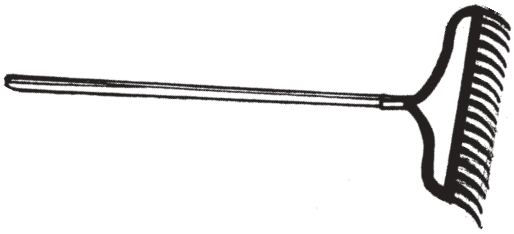
6.



Wheelchair ramp

.

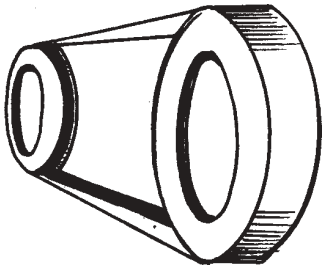
7.



Rake

_____

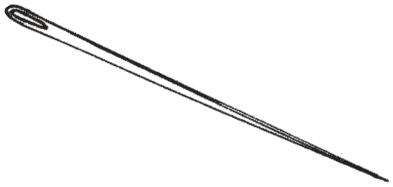
8.



Fan belt

_____

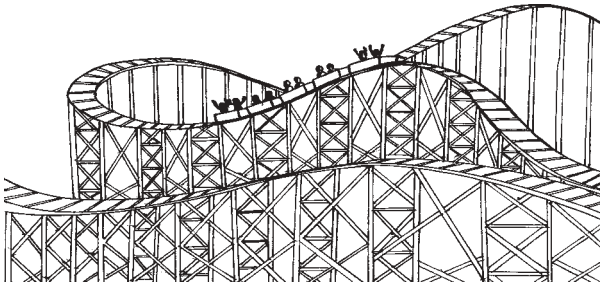
9.



Needle

_____

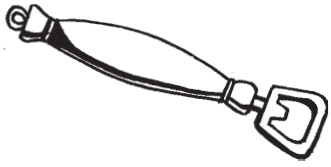
10.



Roller coaster

_____

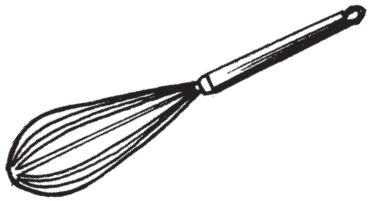
11.



Bottle opener

_____

12.



Eggbeater

Finished? Compare your answers with those in the *Answer Key* on pages 46–48.

Let's Remember

- Simple machines are simple tools that make work easier and faster.
- Work takes place when distance is covered as a result of an applied force.
- Simple machines are classified into: inclined plane, lever, pulley, screw, wedge, and wheel and axle.

    1. **Inclined plane** is a slanting or sloping surface that connects a lower level to higher level.
    2. **Lever** is a bar or arm that turns or lifts against a "fulcrum" or support.
    3. **Pulley** is a simple machine that uses a rope, belt or chain wrapped around a wheel.
    4. **Screw** is a spiral form of the inclined plane.
    5. A **wedge** is a simple machine with at least one slanting side ending in a sharp edge.
    6. **Wheel and axle** is a simple machine, made up of a round object (wheel) and a cylindrical object similar to a stick (axle).

LESSON 2

The Uses of Simple Machines

In Lesson 1, we learned about the concepts and the six classifications of simple machines. Now, we will learn exactly how simple machines work. Are the applications for each simple machine the same? Or are simple machines used and applied differently?

After studying this lesson, you should be able to:

- explain how each simple machine helps do work more easily; and
- demonstrate how each simple machine can be used in different situations.

Let's Study And Analyze

Much of the work that simple machines do is a response to what human people cannot do. Is that all that simple machines can do? You're about to find out, so continue reading on.

Let's start with the **inclined plane.** This simple machine was used by the Egyptians to build the pyramids. How? An inclined plane is used to lift heavy loads with less effort or force. Let's study this carefully through the activity on the next page.

It's Linda's first day on her job as a saleslady. Her task is to put canned goods on the shelf.

1. Give suggestions on how Linda should do the task.

   _____
   _____
   _____
   _____

2. Again, based on your suggestions, what is the best way to accomplish the task, and why?

   _____
   _____
   _____
   _____
   _____

3. What do you think of the inclined plane? How do you think will it make Linda's task easier?

   _____
   _____
   _____
   _____

After writing down your answers, compare them with those in the *Answer Key* on page 48.

The inclined plane reduces the amount of force needed to lift the object. The longer the distance of the inclined plane, the easier is the work involved. Remember the pyramids of Egypt? Millions of limestone blocks were moved hundreds of miles over twenty years, weighing 2 to 70 tons each. Ramps or inclined planes over a mile long were used to place the limestone blocks in their place.

How do you think this was done? Let's look at the picture below.

4. Imagine the boy as one of the workers who built the pyramids of Egypt. Let's pretend that the box filled with books is a limestone block. Can you give suggestions on how the boy should do it?

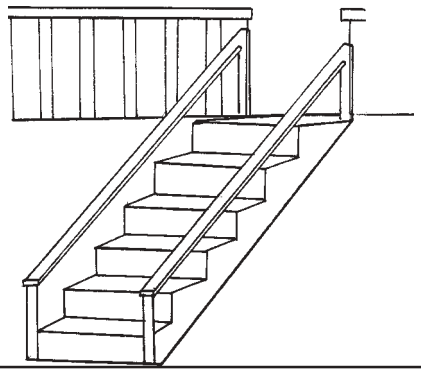
   _____
   _____
   _____

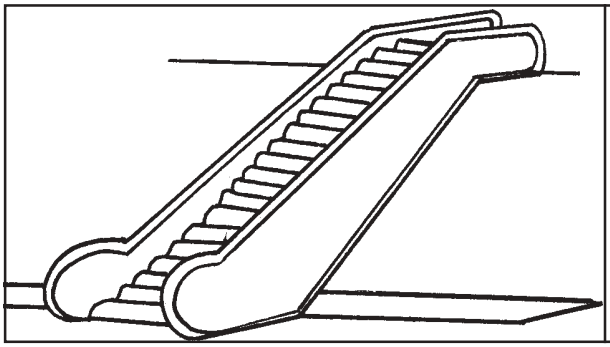
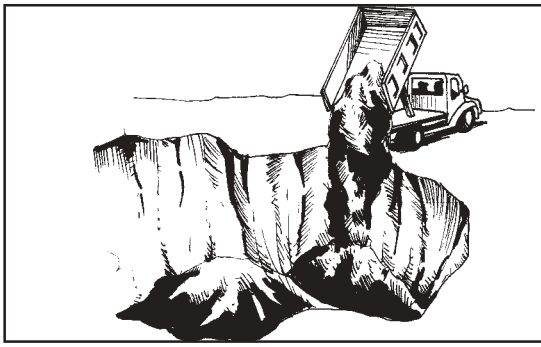
5. Based on your suggestions, which do you think is the better way and why?_____
   _____
   _____

Again, compare your answers with those in the *Answer Key* on pages 48–49.

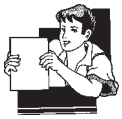
Let's Try This

Shown below are examples of inclined plane. Give everyday situations where they can help make the work easier for you.

	1.

	2.
	3.

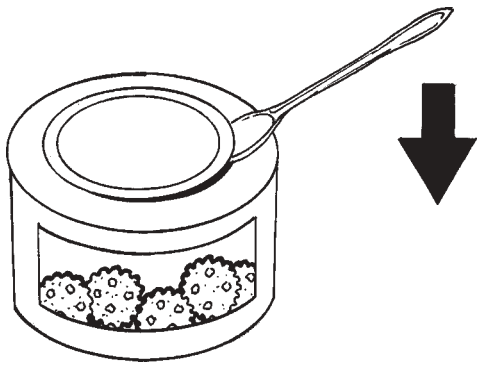
Compare your answers with those in the *Answer Key* on page 49.

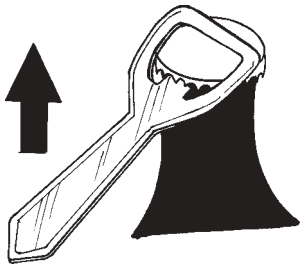
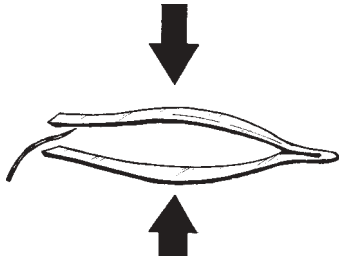


Let's Learn

Do you still remember the seesaw? Aside from being a permanent fixture in playgrounds, a **seesaw** is the most common example of a lever. The lever, in this case, is used to lift weights.

But that is not all what a lever does. The **lever** is also quite dependable in removing or pulling out something loose. The lever is such a useful simple machine that it is grouped into three types. Can you guess the three types of levers? If you can't yet, that's okay. Just read on to identify them.

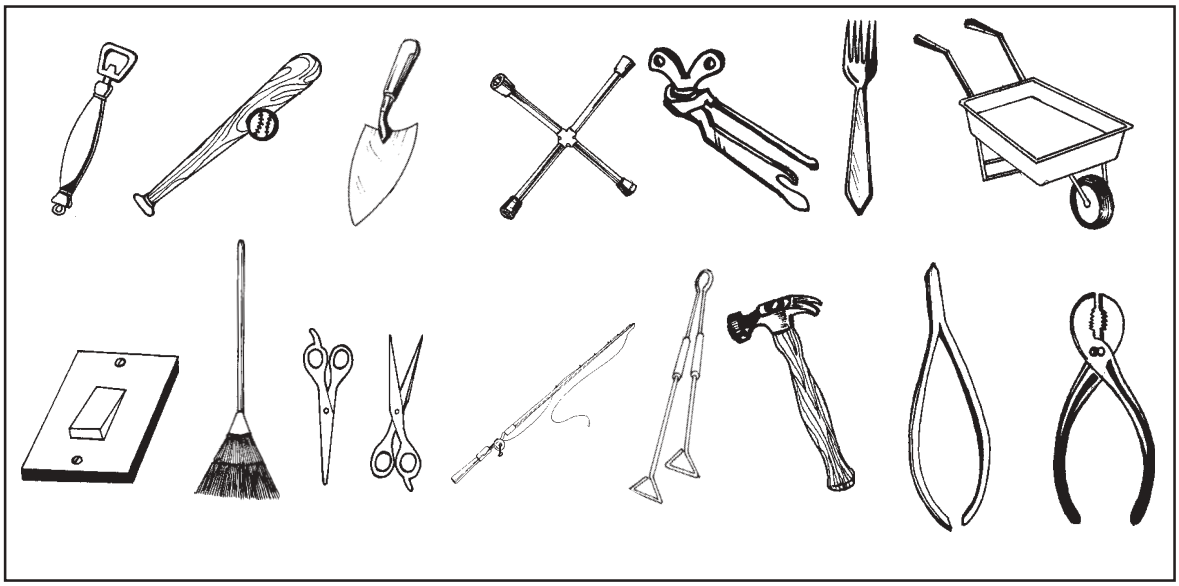
First Class Lever is a lever where the fulcrum is found between the force and the load. In the example on your right, the fulcrum is the edge of the tin can of biscuits. The lever changes the direction of force: as the handle of the spoon goes down, the lid goes up.	 **Spoon used as lever to open can of biscuits**

Second Class Lever is a lever where the fulcrum is at one end of lever, the force at the other end, and the load in the middle.	 **Can or bottle opener**
Third Class Lever is a lever where the fulcrum is at the opposite end of the load, with the force being applied in the middle.	 **Tweezers that pull or remove hair**

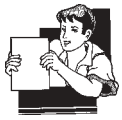
Let's Try This

In the first column of the table below, there are jumbled letters that form the name of common levers. Unscramble them to form the correct words or names. Then, put a check mark (3) under the type of lever to which it belongs. Review the illustrations on the next page to serve as guide.

Lever	First Class	Second Class	Third Class
1. T T E O B L E E O N R P			
2. A A E L B B S L A B T			
3 L E V O H S			
4. C H R N E W			
5. N C A E E N O P R			
6. K O R F			
7. L E E H W W O R R A B			
8. T H G I L W S T I H C			
9. O O M R B			
10. G N H S F I I D R O			
11. S S S S I O C R			
12. N G T O S			
13. M M H R E A			
14. E E E Z W T R S			
15. S R E I L P			



Compare your answers with those in the *Answer Key* on pages 49–50.



Let's Learn

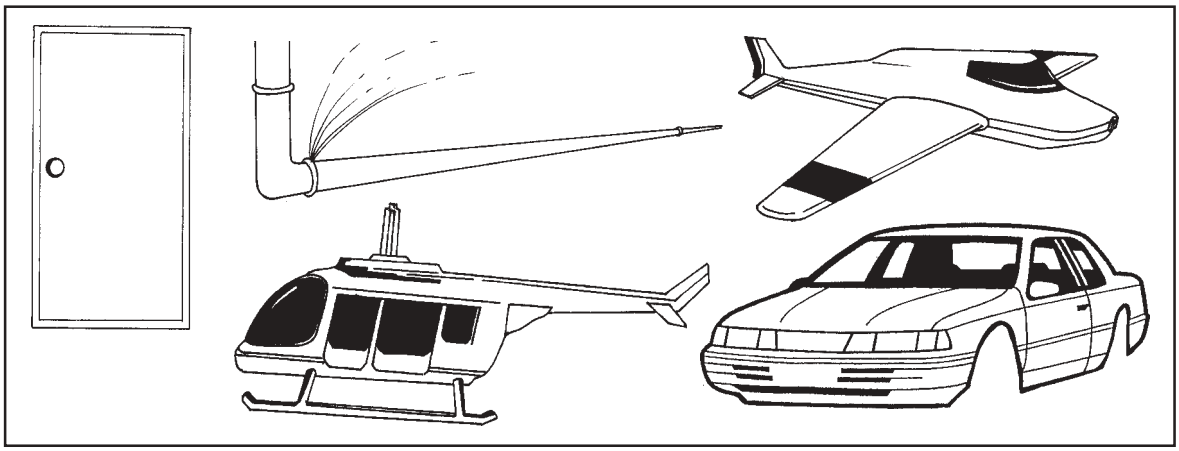
Now let us study the contributions of simple machines in the area of transportation. We are referring to the wheel and axle.

The **wheel and axle** is best remembered as the big wheel and the small wheel. It is a simple machine that causes movement. Also, the wheel and axle can be used to lift loads. This simple machine is considered to be the most important invention in history. Why do you think so? To help you answer the question, look at the pictures below. What is wrong with them?

_____

_____

_____



Without the wheel and axle:

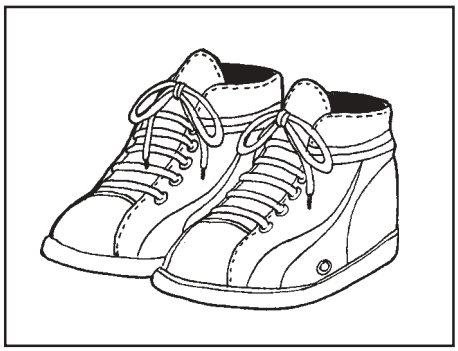
1. there will be no door knobs to open and close doors with;
2. there will be no water faucets that will regulate the flow of water through a pipe;
3. there will be no propellers that will make airplanes and helicopters fly; and
4. there will be no wheels on a car.

Now, can you just imagine how different life would be without this simple machine? Can you think of some more examples of the wheel and axle? If you have, share this information and discuss it with your co-learners.

Let's Think About This

Don't you feel that, somehow, simple machines have taken the fun out of living a simple life? Because of the wheel and axle, cars, buses, jeepneys and other modes of transportation, walking seems to have become a thing of the past.

But speaking of appreciating the simple things in life like walking, there is a simple machine that, in a way, helps us accomplish this. It's the **pulley.**



This is a pair of rubber shoes. No, the pair of rubber shoes is not an example of a pulley, but the shoelaces are. Do you know why? This is why: a pulley is used to raise, lower, or move a load.

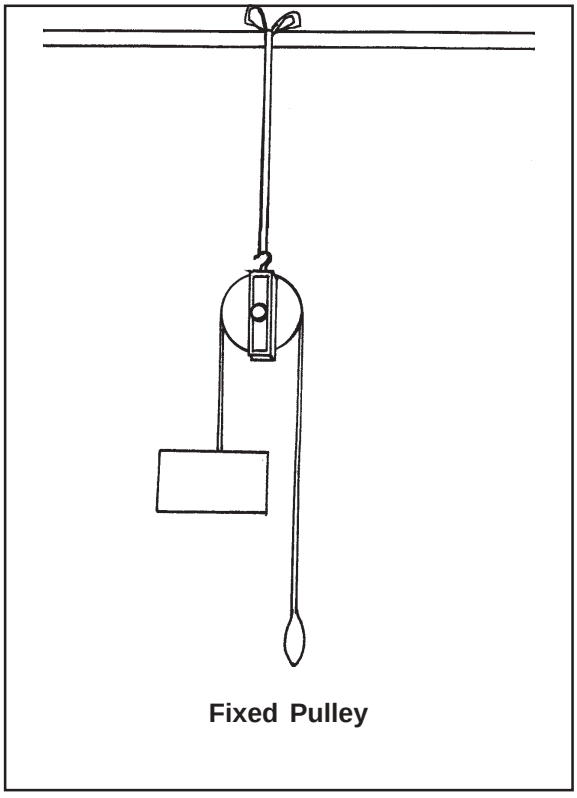
Do you have a pair of rubber shoes with shoelaces on? If yes, then you do know that the shoelaces are placed into the shoelace holes to move the tongue and the upper parts of the shoe close enough so that the feet are "secured" inside the shoes.

So every time you're taking a walk or even jogging or running, remember that the shoelaces on your shoes are actually simple machines.

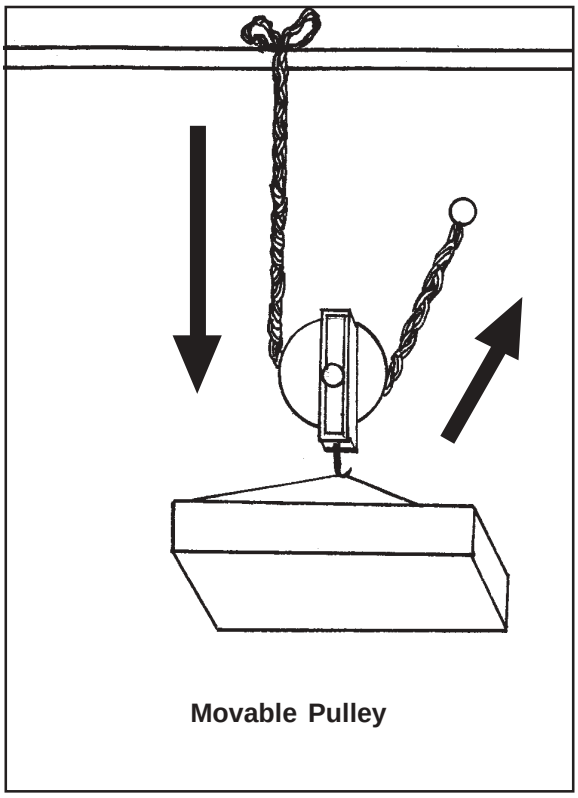
Let's Study and Analyze

But there's more to pulleys than shoelaces. In fact, there are three types of pulleys. As discussed in the basic set-up for a pulley on page 19, a pulley changes the direction of the force. This means that instead of directly lifting up an object, you can pull down one end of the rope and cause the object on the other end to lift up, or vice versa.

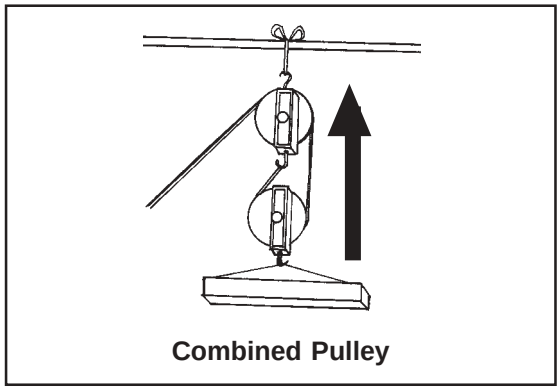
Look at the drawings below. They show three types of pulley: the *fixed pulley,* the *movable pulley,* and the *combined pulley.* Take note of the different directions of the force applied and the load. What do you observe for each type of pulley? Can you try giving examples of pulleys based on your observation? Write your answers on the spaces provided on the next page. (Here's a hint: They can be compared to the three types of levers.)



Fixed Pulley



Movable Pulley



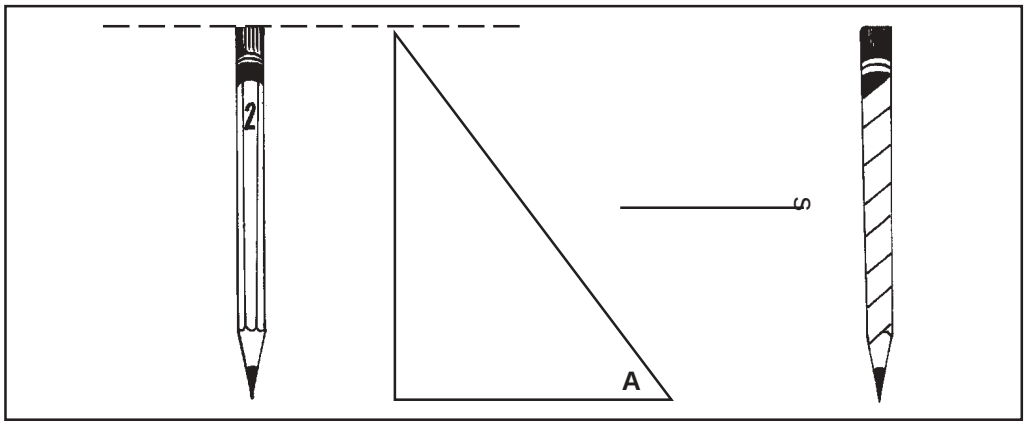
Combined Pulley

_____
_____
_____
_____
_____
_____

Compare your answers with those in the *Answer Key* on page 50.

Let's Try This

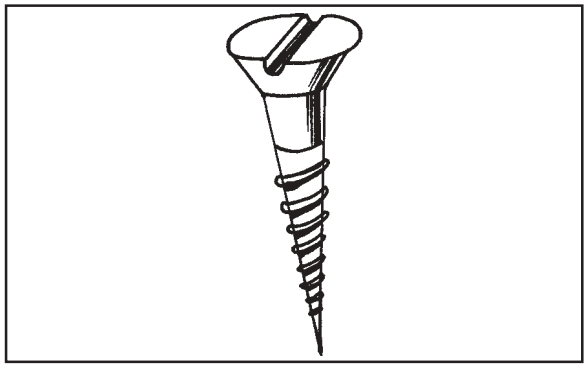
In Lesson 1, you learned that a screw is another form of an inclined plane. How similar is this simple machine to an inclined plane? Let's do this activity to find out.



You need a pencil and a paper cut or folded into a triangular shape. Make sure that the height of the triangle (as shown in the illustration) is the same as that of the pencil. Now holding point A of the triangle (again, as shown in the illustration), start wrapping the paper around the pencil.

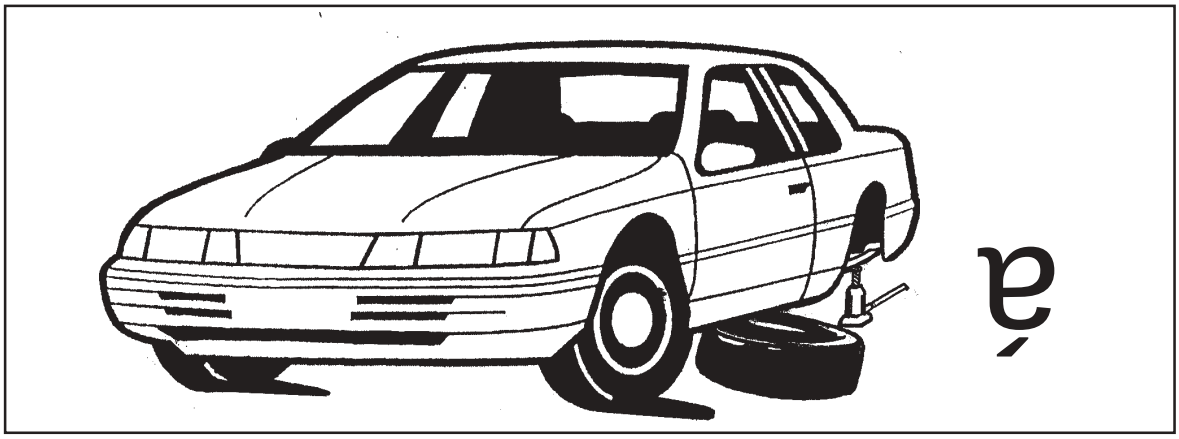
What do you have now? Does it look familiar to you? What you have right now is a **screw.** The inclined plane (the paper triangle) is wrapped around a cylindrical post (the pencil).

To be exact, what you have with you is what a standard screw looks like. Compare it with the illustration below.



What do you think? Aren't they the same thing? Look closely at the threads on your pencil wrapped in triangular paper. I'm sure you're now convinced that a real screw is very, very similar to the outcome or product of our previous activity.

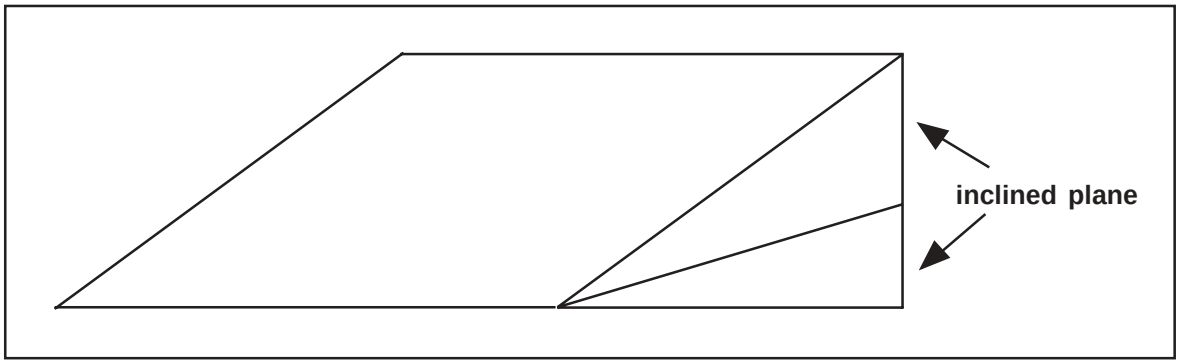
This standard screw, like any other examples of a screw, holds or fastens things together. A screw may also be used to lift materials. Have you seen a car jack? If not, you may look at the illustration below and see how the car jack is used to lift a car or any vehicle.



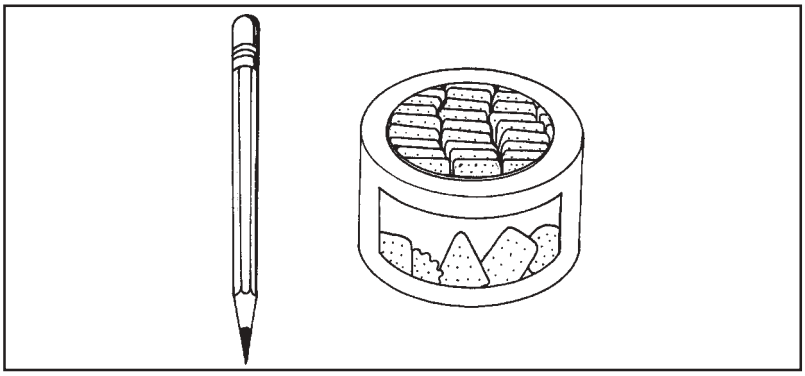
Let's Study and Analyze

The screw is not the only simple machine that is similar to an inclined plane. The last simple machine that you will learn in this module is also another version of an inclined plane. This is the wedge.

A **wedge** is similar to an inclined plane because its parts with the sharp edges can be likened to two inclined planes placed back to back.



To further illustrate the wedge's capabilities, let's do this.



Use a sharpener to sharpen your pencil. Was the pencil sharpened? Bite into a biscuit, using your teeth of course. Were you able to eat the biscuit easily?

What is common between the sharpener and your teeth? Write your answer in the blank spaces below.

_____

_____

_____

_____

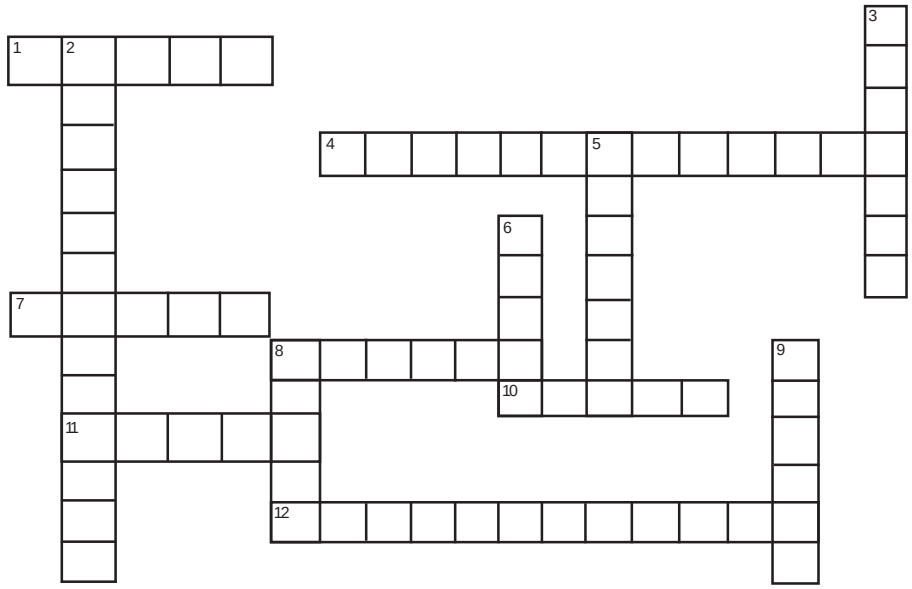
_____

Compare your answer with the one in the *Answer Key* on page 51.

This is why a wedge can be used to cut, split or fasten objects. The sharpener and the teeth have sharp edges which cut or split materials, in this case, the pencil and the biscuit.

Let's See What You Have Learned

This is a crossword puzzle. Fill the puzzle by answering the questions below.



Across

1. A type of pulley used in raising a flag up the pole
4. A simple tool used to make work easier to do (2 words)
7. Another variation of an inclined plane used to cut materials
8. An example of inclined plane used in going up or down a house or a building
10. A part of the mouth that can be used to chew food with
11. A seesaw is the most common example of this simple machine
12. Also known as big wheel and small wheel

Down

2. Used to lift heavy loads with less effort by pushing the loads along its surface until the loads reach their place where they should be
3. Used to identify screws
5. A pulley very similar to the way the second class lever works
6. _____, second and third class levers
8. A spiral form of the inclined plane
9. A _____ changes the direction of the force

Compare your answers with those in the *Answer Key* on page 51.

Let's Remember

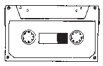
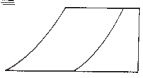
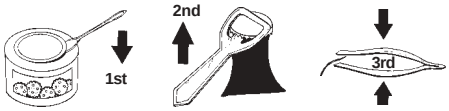
- The six simple machines work differently from each other. Although some simple machine may be somewhat similar to each other, there are distinct differences that set each simple machine apart.
- The **inclined plane** is used primarily to lift heavy loads with less effort and force. The longer the distance of the inclined plane, the easier is the work required. This is because the lesser the steepness of the plane, the lesser force is needed to move the load.
- The lever can be used for lifting weights, removing or pulling out things that are loose. There are three types of levers, namely: first class, second class and third class levers.
- The **wheel and axle** is easily remembered as the simple machine with a big and small wheel. It is a simple machine that causes movement.
- A **pulley** is used to make lifting easier. It changes the direction of the force. So if you want something lifted, you would have to pull down when using this simple machine. Like the lever, the pulley has three types, namely: fixed, movable and combined pulleys.
- A **screw** is a variation of the inclined plane only that it (the inclined plane) is wrapped in a cylindrical post. It is used to lift materials, and hold or fasten things.
- A **wedge** is also another variation of the inclined plane in that it has inclined planes placed back to back. This enables this simple machine to cut or split certain materials apart.

Let's Sum Up

- Simple machines are simple tools that make work easier and faster.
- Work takes place when distance is covered as a result of an applied force.
- Simple machines can be categorized as: inclined plane, lever, pulley, screw, wedge, and wheel and axle.
- Simple machines help us lift, pull, change the direction of the force, split, cut or fasten things.
- We all use simple machines everyday: to open a door, to turn on the water faucet, to tie up our shoelaces, to go up or down a flight of stairs, or even just to eat.

What Have You Learned?

Below are examples of simple machines with illustrations and some key words. Group or classify them according to the category of simple machine they belong to. Write your answers on the table on the next page.

1. bottom end of a light bulb 
2. roller skates 
3. drill 
4. clothesline 
5. tape 
6. doorstop 
7. sail 
8. "ramp" 
9. threads 
10. first, second and third class 

11. cars, vehicles, automobiles 
12. fixed, movable and combined
13. knife 
14. weighing scale 
15. screwdriver 
16. pair of scissors 
17. chisel 
18. telephone dial 
19. "tiny ramps" 
20. most important invention in history 

Inclined Plane	Lever	Pulley	Screw

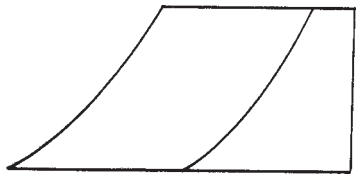
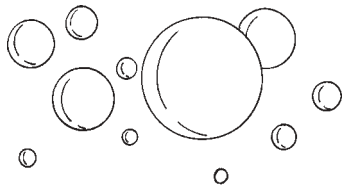
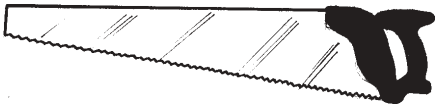
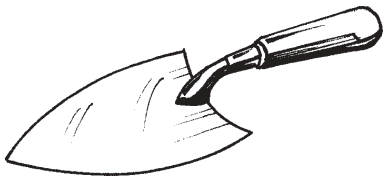
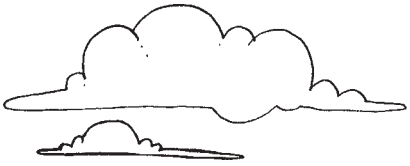
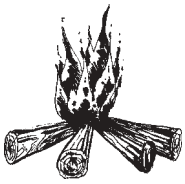
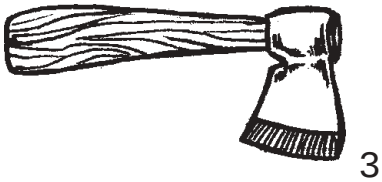
How did you do? You can compare your answers with those found in the *Answer Key* on pages 51–52. You are now very knowledgeable about simple machines. You can study this module again to review what you have learned. If you missed some answers, don't worry. Review the parts of the module that you did not understand.

Once you are able to answer all the review questions correctly, then you are done with this module. You have been a good learner, so now you can move on to the next module. Congratulations and keep up the good work!

Answer Key

A. Let's See What You Already Know *(pages 2–3)*

A.

 3	 7
 3	 3
 7	 3
 7	 3
 7	 3

B. 1. Simple machines

2. inclined plane, lever, pulley, screw, wedge and wheel, and axle (in any order)

3. inclined plane, lever, and pulley

4. wheel and axle

5. Work

6. force

7. lever and wedge

8. distance

9. pulley

10. wedge

B. Lesson 1

Let's Study and Analyze (pages 5–6)

Here is a sample answer. Bear in mind that the answers you may come up with may be different, but they may also be correct. Show your answers to the Instructional Manager for additional feedback.

In Figure 1, a man is shown standing near a box. In Figure 2, the same man is shown pulling up the same box. In Figure 3, the same man is shown carrying the box from one point to another. The three figures altogether show that work has been accomplished.

Let's Think About This (pages 7–9)

A. I cannot imagine a car moving without its wheels. A car or any land vehicle is deemed useless without its wheels.

B. The flag was hoisted up the pole using a pulley. Other possible ways of raising the flag up could be by using a ladder, but using a pulley to accomplish just that is the easiest and most practical so far.

C. Our mothers or cooks would have a hard time preparing food if there are no knives or peelers to help them. There is evidence that even the earliest of men used sharp stones or rocks to cut their food into small pieces so that they could be eaten properly. Doctors would not be able to perform medical procedures like a surgery if not for tools such as scalpels. If not for simple machines, airplanes or ships would not have been invented thus, making traveling very tiring and difficult.

Let's Think About This (pages 9–10)

Here are sample answers. Show your answers to the Instructional Manager for additional feedback.

Home:
1. faucet or tap
2. broom
3. light switch
4. electric fan
5. kitchen utensils such as knives, can and bottle openers, etc.

School:
1. flagpole
2. ladder
3. ceiling fans
4. pencil sharpeners
5. slides, seesaw on the playground

Neighborhood:
1. construction materials such as hammer, shovel, wheelbarrow, etc.
2. bicycles
3. stairs
4. cars and other vehicles

Let's Learn (pages 10–11)

Here is a sample answer. It's okay to come up with an answer different from what is given here. Show your answers to the Instructional Manager for additional feedback.

I strongly believe that we would not be where we are right now, in terms of development and technology, if not for the simple machines. In many ways, simple machines have become our partners in our daily activities. Their contribution to man's existence can never be ignored.

Let's Study and Analyze (page 12)

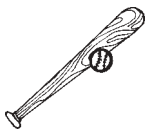
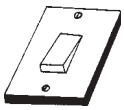
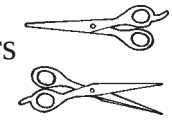
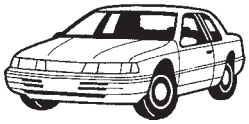
Here is a sample answer. Show your answers to your Instructional Manager for additional feedback.

The inclined plane is a very familiar simple machine. Instantly it reminds me of the ramps used to load drums or barrels inside a truck or a van. Also, the wheelchair ramps found in most public offices or a slide in the playground reminds me of the inclined plane.

Let's Try This (page 14)

1. ladder
2. escalator
3. stairs
4. dump truck
5. hill

Let's Try This (page 16)

1. oar 
2. baseball bat 
3. fork 
4. light switch 
5. pair of scissors 
6. car 
7. ruler 
8. eraser 

9. spoon 
10. hat 

Let's Try This (pages 17–18)

1. A hammer is an example of a lever.
2. A door knob is an example of a wheel and axle.
3. A chisel is an example of a wheel and axle. (As additional knowledge, note that a chisel is also an example of a wedge. You will learn why this is so later as you go on.)
4. A screwdriver is an example of a wheel and axle. However, the tip of the screwdriver may also be considered as an example of a wedge. More about this later on.
5. A hatchet is an example of an inclined plane. (Later on, you will see that it can also be a wedge.)
6. A seesaw is an example of a lever.
7. A slide is an example of an inclined plane.
8. A broom is an example of a lever.
9. A bicycle is an example of a wheel and axle.
10. A shovel is an example of a lever.

Let's See What You Learned (pages 21–25)

A. Here are sample answers. Show your answers to your Instructional Manager for additional feedback.

   1. Simple machines are important primarily because they make our work easier. Man's capability to do work is limited and simple machines help us save the limited energy that we have by providing us assistance in our daily tasks. There are many examples of daily activities where simple machines are such a great help that without them it would be very difficult to accomplish anything at all. Imagine life without a can opener—how do we open our favorite can of sardines for breakfast? In school, how can students participate in written exercises if their pencils broke and there's no sharpener around? What will farmers use to till their lands if there are no tools like hoes, plough, etc.? What do you think traveling would be like without the wheel and axle?

2. I think any simple machine is as equally hardworking and dependable as the others. But for the sake of discussion, I'd say the inclined plane. I chose the inclined plane simply because it can also be seen in other simple machine like the wedge and the screw.

3. Since our kitchen is the most used part of our house, I would say the wedge and the lever. Kitchen utensils like knives, can openers and peelers are seen everywhere and are therefore, the most frequently used tools around because of the family's love for cooking and eating. Family members are also fond of tinkering around with house tools such as hammers, screwdrivers and pliers, which are also found in the toolbox under the kitchen cabinet. These are just a few of the things representing the two simple machines frequently used in our house.

4. This is because the others like the screw, wedge and wheel and axle are just variations or modifications of the three main classifications of simple machines. For example, the pulley makes use of grooved wheels and its rope acts as levers when pulling a load. A screw, in itself, is an example of a screw but when in use it works very much like how a wheel and axle works. And whether a metal screw is a screw or a wheel and axle, when you look closely, what you'll see are small ramps or inclined planes wrapped around the cylindrical post.

5. Yes. Some parts of the human body work like simple machines. They help us do work easily so that the body may survive. For example, the teeth help us cut, slice or grind the food we take in. Thus, they are an example of a wedge. Our skeletal muscles work in pairs to help us pull the bones which facilitate movement of the body. In a way, these muscles work like levers or pulleys in our bodies.

B. 1. screw/inclined plane
2. wheel and axle
3. wedge
4. pulley
5. screw

6. inclined plane
7. lever
8. pulley
9. wedge
10. inclined plane
11. lever
12. wheel and axle

C. Lesson 2

Let's Study and Analyze (pages 26–28)

Here are sample answers. Your answers may not be the same, but they are not necessarily wrong. Show your answers to your Instructional Manager for additional feedback.

1. Linda could put one or at least two canned goods at a time by standing on a chair or a stable platform. Another option is for her to just stretch her arms long enough to reach the top shelf, but this is not safe. Another way to put the canned goods into the shelf is for her to use a ladder.

2. I think the last option offers the best solution because it is the most practical and safest way. Standing on a chair or a stable platform may be safe as well but moving down the lower shelves may be inconvenient or straining on the back as she would have to stoop. But the ladder would enable her to move up or down the shelves with less effort and more comfort.

3. The inclined plane does not eliminate the force or effort that one will use in work; it does, however, make the work easier and more manageable. Although in this case, Linda would still have to move up or down, the ladder makes this physical work more convenient, safer and less of a back-breaking activity.

4. I guess the boy could just carry the box filled with books and place it on the table. Another way of doing it would be to place one end of the ramp on the table and the other end resting on the floor. The box is placed on the ramp and is pushed up until it rests on the table.

5. I think using the ramp to be able to put the box where it should be placed is the easier way to do this task. Although work is still needed, such work is relatively less compared to lifting the entire box and relying only on one's own strength. Pushing the box up the table using the ramp requires far less energy and puts less strain on the body.

Let's Try This (pages 28–29)

1. A flight of stairs allows us to go up or down a two-storey house or a multi-floored building. Imagine going up a house using a rope—that would be totally difficult for most people! The concept of stairs has enabled people to move around houses and buildings. The stairs, in a way, has helped conserve space. How? Houses or buildings, to accommodate more living or office spaces, are constructed with more and more floors, which of course makes stairs a necessity.

2. An escalator is an improved version of the stairs. In an escalator, you don't have to move your feet that much compared to climbing up or down a flight of stairs. You only exert such effort when you're about to board an escalator or when you're about to get off it.

3. A dump truck helps people in–charge of disposing garbage in dump sites. They don't have to manually take the trash from the truck and throw them one by one to the sites. The dump trucks make it possible for huge collections of garbage on many households due to its size. Finally, dump trucks have helped waste managers to develop a more systematic system of garbage disposal.

Let's Try This (pages 30–31)

Lever	First Class	Second Class	Third Class
1. BOTTLE OPENER		3	
2 BASEBALL BAT			3
3. SHOVEL	3		
4. WRENCH	3		
5. CAN OPENER		3	
6. FORK	3		

7. WHEELBARROW		3	
8. LIGHT SWITCH	3		
9. BROOM			3
10. FISHING ROD			3
11. SCISSORS	3		
12. TONGS			3
13. HAMMER	3		
14. TWEEZERS			3
15. PLIERS			3

Let's Study and Analyze (pages 33–34)

Here are sample answers. Show your own answers to your Instructional Manager for additional feedback.

The fixed pulley may have been called as such because it is attached to a fixed or unmovable object like a ceiling or a wall. It can be similarly described as a first class lever because its fulcrum is located at the center or in this case, the axis. The lever in this type of pulley is represented by the rope.

The movable pulley is similar to the second class lever because this time they both have the load at the center of the fulcrum and the force to be applied.

The combined pulley, on the other hand, is similar to the third class lever because force is at the center. The main difference between the two is that the combined pulley needs less effort or force than half of the load, while the third class lever needs greater force than the load.

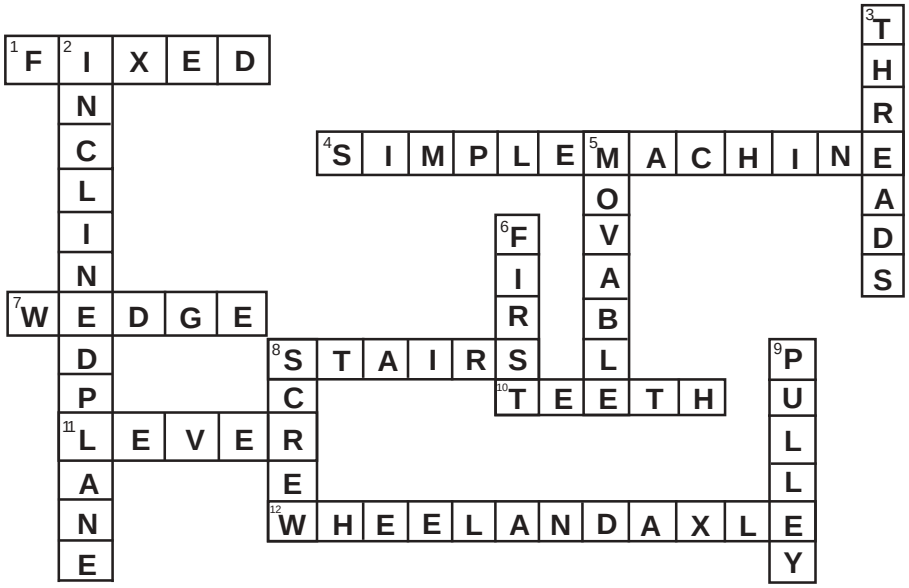
Examples of pulleys would be the grooved wheel with a rope used to raise a flag, sail and also the one found on top of a curtain or blinds.

Let's Study And Analyze (pages 35–36)

Here are sample answers. Show your answers to the Instructional Manager for additional feedback.

Both the sharpener and the teeth can cut or split materials. The sharpener's end product are pencil shavings, while the teeth's are digestible food. A sharpener shaves off wooden parts of the pencil to make it useful for writing or drawing. The teeth cuts or grinds the food inside the mouth so that the food is easily swallowed and eventually digested to provide nourishment for the body. These are like a wedge which has a sharp end that can break apart or split something.

Let's See What You Have Learned (page 37)



D. What Have You Learned? *(pages 40–41)*

Inclined Plane	Lever	Pulley	Screw	Wedge	Wheel and axle
"ramp"	First, Second, Third Class	Clothesline	Light bulb	Doorstop	Roller skate
Chisel	Weighing scale	Sail	Drill	Knife	Tapes
		Fixed, mixed, and combined	Threads		Cars, vehicles and other automobiles

Inclined Plane	Lever	Pulley	Screw	Wedge	Wheel and axle
			Tiny "ramps"	Screwdriver (tip)	Screwdriver (the whole screwdriver)
	Pair of scissors			Pair of scissors	Telephone dial
				Chisel	Most important invention in history

Glossary

Force Anything which causes or changes motion in an object or body

Inclined plane A flat, slanting ramp with one end higher than the other end

Lever A bar or rigid arm that turns or lifts against a support or a fulcrum

Pulley A wheel with a rope, belt or chain wrapped around it

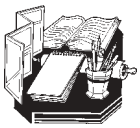
Screw A spiral inclined plane or tiny ramps circling a post

Simple machine A tool used to make work easier

Wedge Two inclined planes placed back to back; something with a pointed edge at one end and a wide edge at the other

Wheel and axle A turning big and small wheel that causes movement

Work What takes place when a force applied to an object or body moves it a distance



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