

# SIMPLE MACHINES UNIT

## CYCLE 2

## SCIENCE & TECHNOLOGY

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# Simple Machines

Machines don't always have to be complicated, in fact we use simple machines everyday. They help us lift, pull, transport, and hold objects together. Without these very basic machines our lives would be a whole lot harder.

## **Amp Up Your Ramp - *Inclined Plane***

Imagine trying to carry a heavy box up a ladder. It would probably be difficult and even dangerous. But if you were to place a long sheet of plywood on the ladder and push the box up, even though the distance is longer, the effort it takes is less.

An inclined plane or ramp is used daily by many people, you may have seen a delivery truck with it's long ramp loading or unloading products. Most buildings today also have an inclined plane for people using wheel chairs.

Ladders and stairs are also sloped to make an inclined plane. The bottom of your bathtub is also an inclined plane because it is sloped to force water toward the drain.



## **Get the 'Wedge' Edge**

What has at least one slanting side and ends in sharp edge? A wedge. A wedge works like a ramp, but instead of moving an object from here to there, it pushes it apart. The narrower the wedge is the easier it is to divide something.

Wedges can be sharp like axes, knives or shovels, or they can be round like the tip of a nail or the tines of a fork. Just imagine how difficult it would be to eat dinner without the help of a knife to cut your food or a fork to pick it up with.



### Simply Screw-ie



Who would've thought a simple screw would be considered a machine, but it is. Screws hold things together and are used in our daily lives. What makes a screw, a screw? The inclined plane that wraps around it, called a thread, and the wedge on the end.

Look at an example of a screw (jars, bottles and their lids are considered screws), if the thread is wide it will be harder to turn, but if it's narrow it will take longer to fasten.

### The Eager Lever

Levers are always ready to work and it's a good thing as they are able to help us lift heavy objects. It's easy to recognize a lever - most things with a handle attached are considered one. Levers consist of a stick and a fulcrum (*fuul-kruh-m*). The fulcrum is the point at which the lever moves. By changing the position of the fulcrum you will either gain or lose power - the closer the fulcrum is to the object the easier it is to lift. Good examples of levers are seesaws, shovels, and crow bars.



### The Wheel Deal

The wheel and axle are one of the oldest, simple machines around. In fact a wheel was found dating back 5,500 years. A true simple wheel and axle machine consists of a rod (axle) secured to a wheel.

A water faucet has a wheel and axle on it. The knob that you turn is the wheel. When you turn the knob, you are also turning an axle that it's attached to.

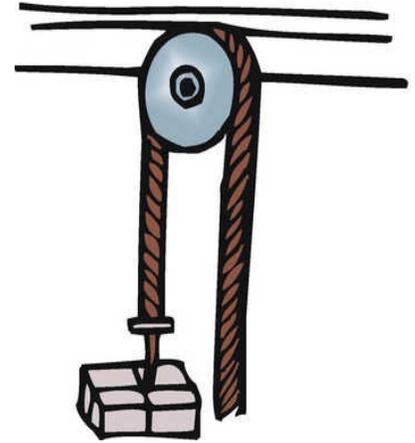
A fan is another example of a wheel and axle. The fan blades (wheel) are attached to a rod (axle). When the motor is turned on, the fan blades will spin and produce a nice cooling breeze on a hot day.



### **Pull That Pulley**

Take a wheel with a groove running around it add an axle and a rope or cable, put them together and what do you have? A pulley.

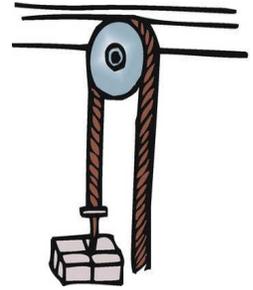
When you work with a pulley, lifting becomes a cinch. Why? Because you're working with gravity by pulling down on the rope. Imagine raising a flag to the top of the pole without a pulley. How would you do it? You could take a ladder and climb to the top and fasten the flag. You could use a ramp and push it to the top. Or you could simply attached it to a pulley and hoist away. Letting pulley's do the job is safe, simple and fun!



## Vocabulary and Actions

<b>Word</b>	<b>Definition</b>
MACHINE	something that makes work easier: make easier, faster, or better
WORK	when a force moves an object
FORCE	a push or pull
PLANE	any flat surface
INCLINED PLANE	a plane that has one end higher than the other
WEDGE	two inclined planes that come to a point to make lifting or splitting easier
SCREW	an inclined plane wrapped around a pole
LEVER	a bar that pivots around a fulcrum
FULCRUM	the point on which a lever rests
WHEEL AND AXLE	a wheel with an axle through its center to move loads
FRICTION	a force that slows objects down when they rub against each other
GEARS	wheels with teeth that fit together
PULLEY	a wheel with a groove for a rope that is used for lifting

# Simple Machines



1. What type of simple machine is found on a water bottle cap?
- a. lever
  - b. pulley
  - c. wheel and axle
  - d. screw

2. How is a wedge like an inclined plane? How is it different?

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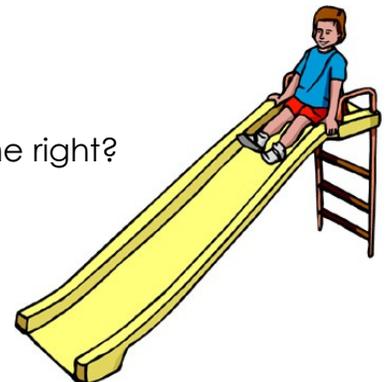
3. On which type of simple machine would you find a fulcrum? Explain what a fulcrum is.

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4. Which is an example of a wheel and axle?
- a. shovel
  - b. water faucet knob
  - c. seesaw
  - d. crow bar

5. What type of simple machine is shown in the picture to the right?
- a. inclined plane
  - b. pulley
  - c. wheel and axle
  - d. wedge



# Searching For Simple Machines

List two examples of each type of simple machine.



**Inclined Plane**

1. \_\_\_\_\_

2. \_\_\_\_\_

**Wedge**

1. \_\_\_\_\_

2. \_\_\_\_\_

**Screw**

1. \_\_\_\_\_

2. \_\_\_\_\_

**Lever**

1. \_\_\_\_\_

2. \_\_\_\_\_

**Pulley**

1. \_\_\_\_\_

2. \_\_\_\_\_

**Wheel and Axle**

1. \_\_\_\_\_

2. \_\_\_\_\_



\_\_\_\_\_ 8. Which of these is **not** an example of an inclined plane?

- a. ladder
- b. stairs
- c. wall
- d. driveway

\_\_\_\_\_ 9. Which is an example of someone using a simple machine to do work?

- a. a boy runs across a football field
- b. a banker counts money
- c. a mother pushes a stroller up a ramp into a building
- d. a girl eats a sandwich

\_\_\_\_\_ 10. Jan is using a screwdriver to insert a screw. The screwdriver is being used as...

- a. a pulley
- b. a screw
- c. a lever
- d. a wheel and axle

\_\_\_\_\_ 11. Thomas is using a screwdriver to pry open a paint can. The screwdriver is being used as...

- a. a pulley
- b. an inclined plane
- c. a screw
- d. a lever

\_\_\_\_\_ 12. Which is a characteristic of simple machines?

- a. They run on electricity.
- b. They take a long time to make.
- c. They have few or no moving parts.
- d. They are not very large.



\_\_\_\_\_ 13. Which type of simple machine would be found on the bottom of a wagon.

- a. a pulley
- b. a screw
- c. a wedge
- d. a wheel and axle

\_\_\_\_\_ 14. What two parts might make a pulley?

- a. wheel and axle
- b. wheel and wire
- c. wheel and screw
- d. wheel and fulcrum

# Simple Machines

The six types of simple machines are:

- inclined plane
- wedge
- screw
- lever
- pulley
- wheel and axle

1.



An ax is used to chop wood. The metal part chops through the wood, pushing it apart into two smaller sections.

Which simple machine is found on the head of this ax? \_\_\_\_\_

2.



The center of this seesaw is used to balance the board with the seats. The children can easily move up and down without much force.

The seesaw is an example of which simple machine? \_\_\_\_\_

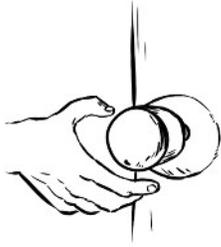
3.



The cap on this water bottle has a spiral shape. When you place it on the bottle and twist, the cap pulls itself toward the bottle.

The bottle cap is an example of which simple machine? \_\_\_\_\_

4.



When you turn the large knob on a door, a rod on the inside releases the a latch that holds the door closed. It would be difficult to turn the rod, if the knob wasn't attached to it.

The door knob and rod make up which simple machine? \_\_\_\_\_

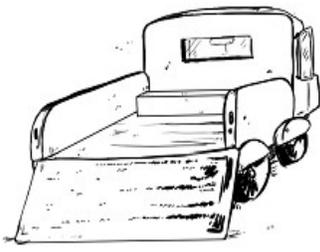
5.



A wheel with a rope is used to hoist a flag up to the top of a tall flagpole. This simple machine can also be used to help lift heavy objects with less force.

The wheel and rope make up which simple machine? \_\_\_\_\_

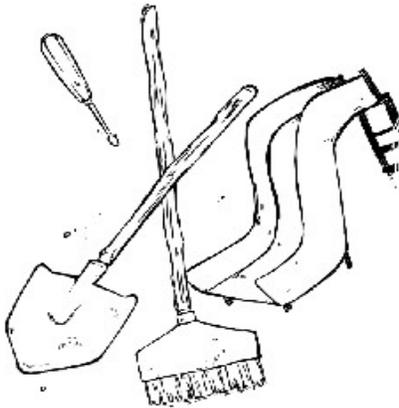
6.



A ramp is used for loading this truck. A mover can pull a cart with a heavy object up the ramp. This is much easier than lifting heavy objects into the truck.

Which simple machine is on the back of this truck? \_\_\_\_\_

7.



What types of simple machines do you see in the picture?

The wheelbarrow is \_\_\_\_\_.

The shovel is \_\_\_\_\_.

The broom is \_\_\_\_\_.

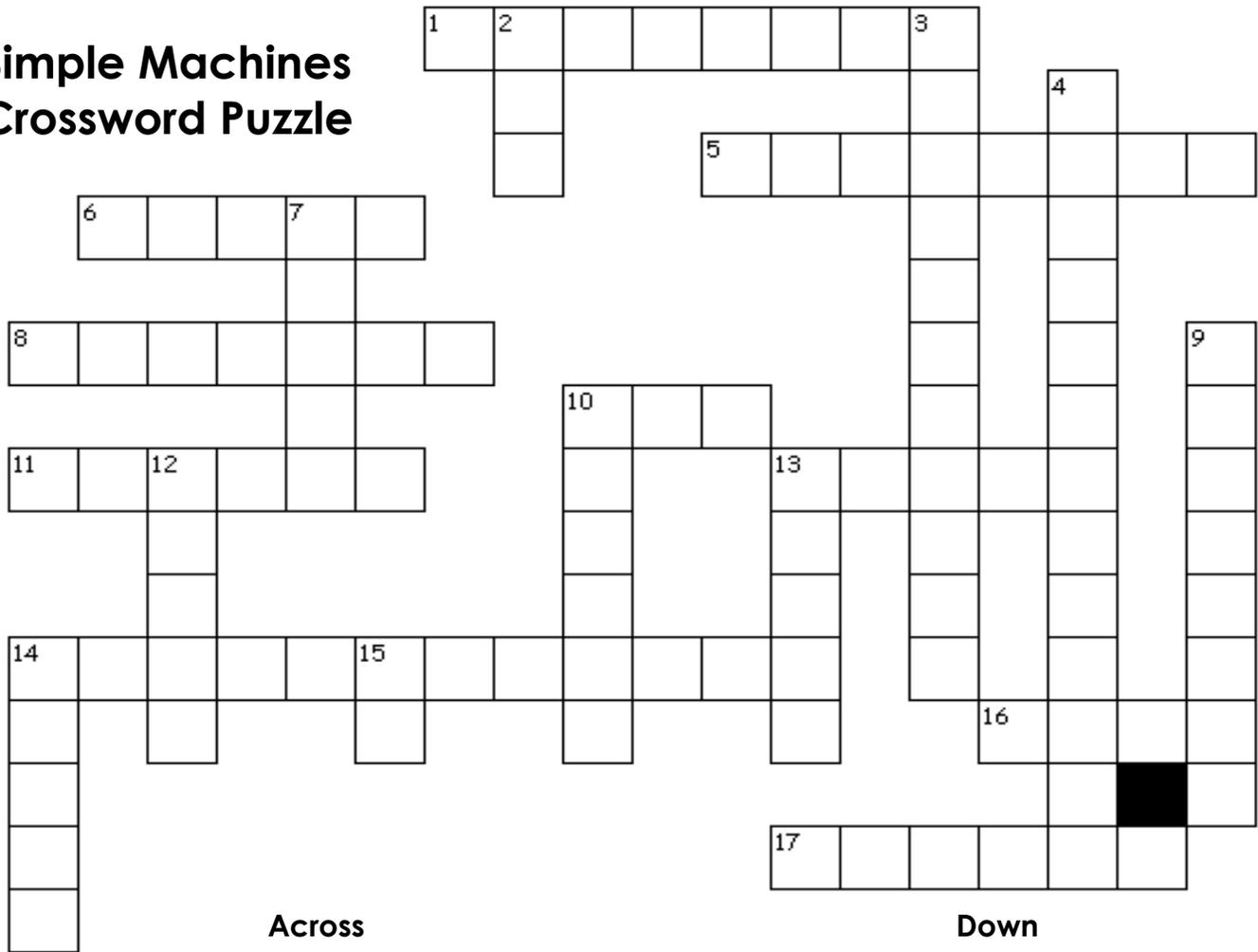
The screwdriver is \_\_\_\_\_.

### Simple Machines Crossword Puzzle: Word Box

(Some words will not be used.)

ax	force	pulley	seven
bottom	four	rake	shovel
broom	fulcrum	sail	six
building	hammer		slide
cap	incline		swing
doorknob	knife	screw	wedge
five	lever	screwdriver	wheel and axle
flagpole	nail	seesaw	wrench

# Simple Machines Crossword Puzzle



**Across**

**Down**

1. tool with two levers attached together for cutting paper
2. part of a water bottle with a screw
3. wheel and axle tool that is often used with screws
4. type of simple machine that is a flat surface with one end higher than the other
5. wheel and axle device that is turned when you open a door
6. wedge used for cutting food
7. When you push, pull, or turn something you are applying this.
8. fixed point on a lever that doesn't move
9. Pulleys are used to raise a flag up this tall object.
10. number of different types of simple machines
10. lever that kids sit on; often found on a playground
11. type of simple machine that is made of a wheel with a rope or chain
11. type of simple machine made up of a bar that moves on a fixed point, or fulcrum
12. type of simple machine that is spiral-shaped and pulls two things together
13. inclined plane that is often found on a playground
13. type of simple machine that is spiral-shaped and pulls two things together
14. type of simple machine that is made of a wheel attached to a rod
14. a simple machine used to separate something; made up of two inclined planes back-to-back
15. wedge used for chopping wood
15. wedge used for chopping wood
16. pulleys are used to raise this on a sailboat
16. pulleys are used to raise this on a sailboat
17. lever used for digging holes in the ground
17. lever used for digging holes in the ground

# Simple Machines

There are six basic types of simple machines: inclined plane, wedge, screw, wheel and axle, lever, and pulley.

1. What is the man doing with the crow bar? Which type of simple machine is he using?

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2. Why might this woman be drilling a hole? Which type of simple machine will she probably insert in the hole when she's done drilling?

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3. What is this man doing? What type of simple machine is the ladder that he is standing on?

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4. What might the woman doing with the cord, wheel and hook?  
Which basic simple machine is she using?

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5. This man is using a power saw. What do you think he is making?  
The saw blade and the rod it is attached to make up which type  
of simple machine?

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6. What is this man breaking apart? The hammer in his right hand is a  
lever. What type of simple machine is the chisel in his left hand?

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7. The man is using a vise. What does a vise do? How does  
the man operate it? Which type of simple machine is used to  
make the vise open and close?

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# Simple Machine Questions

1. A broom is a lever. Where is the fulcrum? Explain.

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2. An electric fan is made up of several simple machines. Tell where you would find an inclined plane on a fan. Also, tell where you would find a wheel and axle.

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3. Explain how the shoelaces on your shoes are similar to pulleys.

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4. The floor of a bathtub is an inclined plane. Explain.

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# REVIEW--- SIMPLE MACHINES

**Fill in the blank: Write the correct word from the box on the line.**

<b>Machine</b>	<b>Gears</b>	<b>Friction</b>	<b>Force</b>	<b>Bearings</b>	<b>Lever</b>
<b>Fulcrum</b>	<b>Plane</b>	<b>Gravity</b>	<b>Work</b>	<b>Energy</b>	<b>Lifting</b>

- \_\_\_\_\_ is a push or pull.
- A \_\_\_\_\_ is the point on which a lever rests.
- \_\_\_\_\_ are wheels with teeth that fit together.
- A \_\_\_\_\_ is something that makes work better, easier, or faster.
- \_\_\_\_\_ results when a force moves an object.
- \_\_\_\_\_ is a force that slows objects down when they rub against each other.
- A \_\_\_\_\_ is any flat surface.

**Matching: Draw a line from the item in column A that matches the item in column B.**

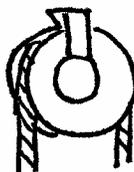
<b>A</b>	<b>B</b>
A screw	is two inclined planes that come to a point to make lifting or splitting easier.
A wheel and axle	is a bar that pivots around a fulcrum.
A pulley	is an inclined plane wrapped around a pole.
An inclined plane	is a plane that has one end higher than the other.
A wedge	is a wheel with an axle around its center to move loads.
A lever	is a wheel with a groove for a rope that is used for lifting.

**True or False: Write T beside each true statement and F beside each false statement.**

1. \_\_\_ Machines make a job easier.
2. \_\_\_ A light bulb is a kind of lever.
3. \_\_\_ A screwdriver is kind of wheel and axle.
4. \_\_\_ An inclined plane makes work harder.
5. \_\_\_ A nail is an example of a wedge.
6. \_\_\_ A hammer is a kind of lever.
7. \_\_\_ A pencil sharpener is a kind of pulley.
8. \_\_\_ A car is an example of an inclined plane.
9. \_\_\_ The flag is raised and lowered with a pulley.
10. \_\_\_ Some objects are more than one kind of simple machine.

**Write the name of each simple machine under its picture.**

Screw	Wheel and axle	Lever	Pulley	Inclined plane	Wedge
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**Label the fulcrum on the machine that has one.**

**Answer each question:**

1. Name two things that reduce friction.

1. \_\_\_\_\_
2. \_\_\_\_\_

2. What two simple machines are in a pair of scissors?

1. \_\_\_\_\_
2. \_\_\_\_\_

3. Name two things that have gears in them.

1. \_\_\_\_\_
2. \_\_\_\_\_

4. What simple machine would you use to get up on a slide? \_\_\_\_\_

5. What simple machine would you use to chop down a tree? \_\_\_\_\_

6. What simple machine would you use to open a door? \_\_\_\_\_

7. What simple machine would you use to take the flag down? \_\_\_\_\_

8. What simple machine would you use to get a big rock off the bike path? \_\_\_\_\_

9. What simple machine would you use to hold two boards together? \_\_\_\_\_

10. What simple machine would you use to keep a door from shutting? \_\_\_\_\_

**Think of what simple machines you would use to do the following job. Tell how you would do it. Please answer in complete sentences.**

**You want to build a jump for your bike. Your dad said you can use the pile of dirt out behind the garage for it.** \_\_\_\_\_

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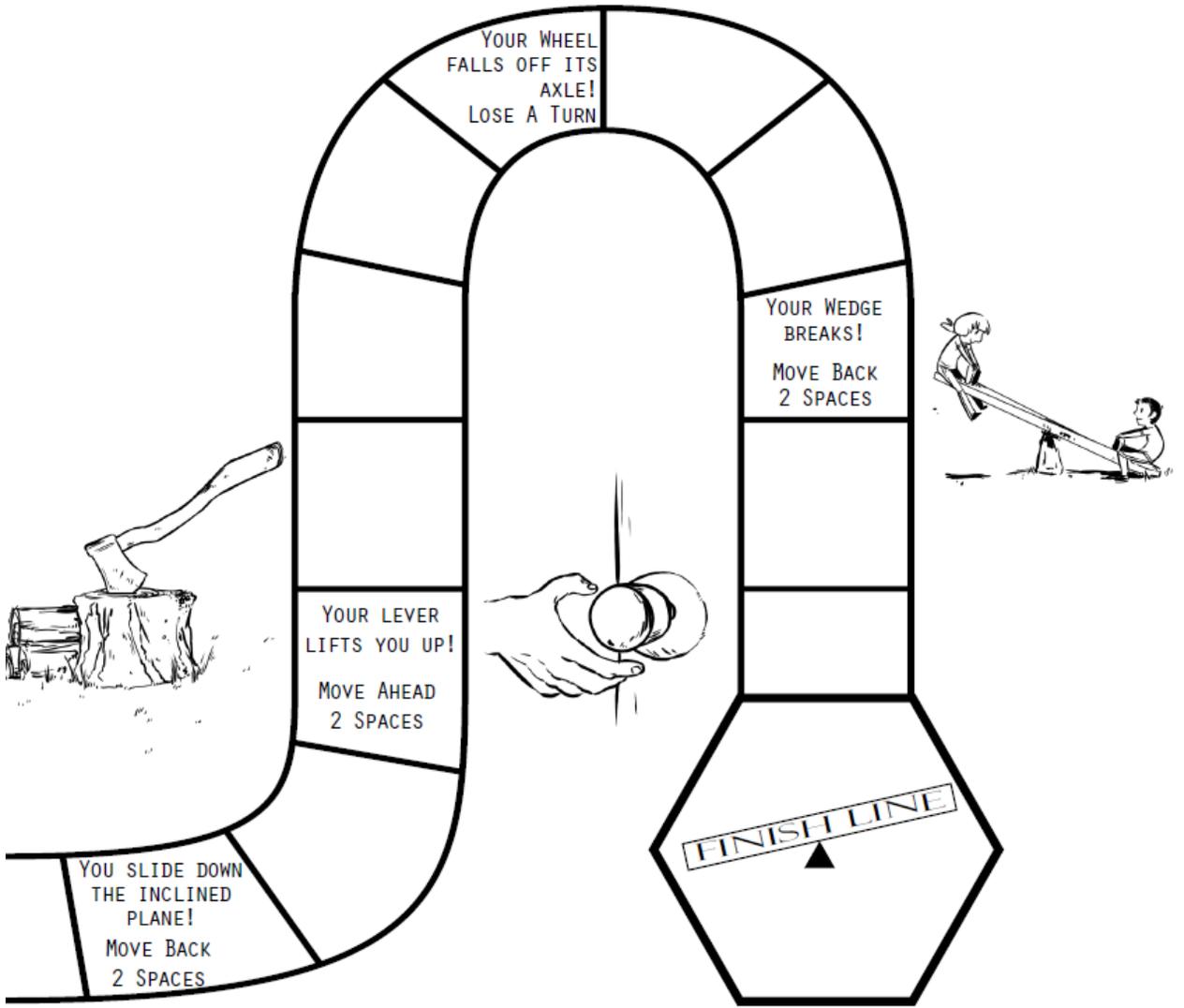
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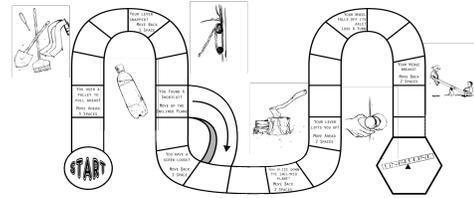
# BOARDGAME

# Simple Machines

## Board Game

### Materials:

- game board (
- simple machine question cards
- 6-sided die
- markers (any small object)



### Preparation Tips:

- Print the question cards on card stock so players cannot see through the paper.

### How to Play:

Begin by setting the markers on "Start."

Each player rolls the die to determine who will go first. The player with the higher number is Player 1. The player with the lower number is Player 2.

Player 1 rolls the die and moves the correct number of spaces. If the player lands on a square with directions, follow the directions.

Player 2 takes a question card and reads it aloud to Player 1. Player 1 tries to answer the question. If Player 1 is correct, he or she stays on the current square. If Player 1 is incorrect, He or she must go back to the square they were on at the beginning of the turn.

Then it is Player 2's turn to roll the die and answer a question.

Continue taking turns until one player reaches the "Finish Line." The first player to land on it and correctly answer the question wins.

### Remember:

A player can only cross the inclined plane shortcut if they land on the square that says, "You found a shortcut!"

If a player lands on "Lose a turn," they skip their next turn.