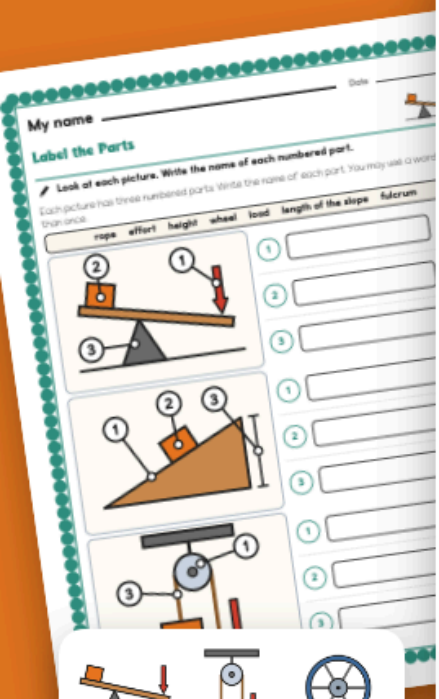
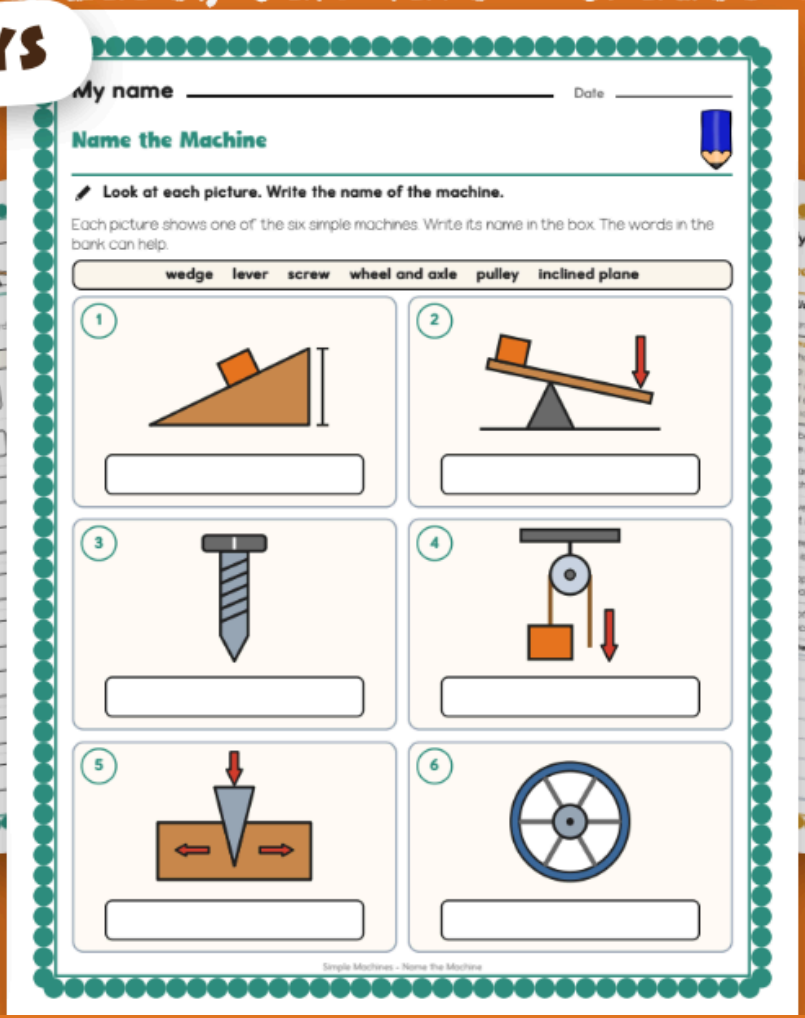
SIMPLE MACHINES

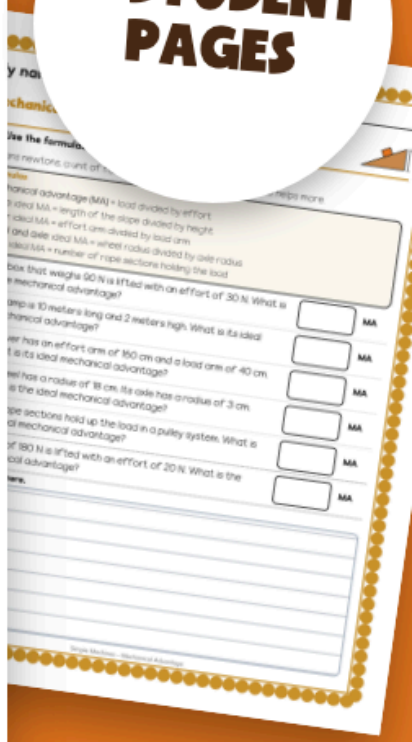
Read, Label, Calculate - Grades 6-8

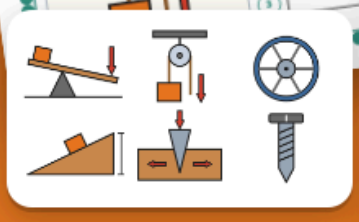
3 ANSWER KEYS

15 STUDENT PAGES









Bright Path Sped

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PREVIEW

Preview - Bright Path Sped

My name _____ Date _____



Before and After Check

Write a letter in the Before box now and the After box when you finish.

These questions are about simple machines. Write the letter of the best answer. Guess if you are not sure. Fill in **Before** now, and **After** when you finish the unit.

1. How many simple machines are in this unit?
   - **A** Two
   - **B** Six
   - **C** Ten

   Before ☐ After ☐

2. What do we call the object a machine moves?
   - **A** The load
   - **B** The fulcrum
   - **C** The thread

   Before ☐ After ☐

3. Which simple machine is a ramp?
   - **A** A lever
   - **B** A pulley
   - **C** An inclined plane

   Before ☐ After ☐

4. What can a simple machine do?
   - **A** Make energy from nothing
   - **B** Change the size or direction of a force
   - **C** Remove all friction

   Before ☐ After ☐

5. Which simple machine is a seesaw?
   - **A** A lever
   - **B** A wedge
   - **C** A screw

   Before ☐ After ☐

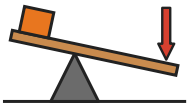
One thing I already know about simple machines is...

PREVIEW

Preview - Bright Path Sped

My name _____ Date _____

Reading 1: The Lever



Read about the machine. Then write the main idea and why it helps.

A bar that turns on a point

A lever is a stiff bar that turns around a fixed point called the fulcrum. The force you push or pull with is the effort. The object you are trying to move is the load. A long lever lets a small effort move a heavy load, because the effort moves through a longer distance. There are three kinds of levers. In a first-class lever, such as a seesaw or a crowbar, the fulcrum is between the effort and the load. In a second-class lever, such as a wheelbarrow, the load is between the fulcrum and the effort. In a third-class lever, such as a broom or a pair of tweezers, the effort is between the fulcrum and the load. A third-class lever does not make the force smaller, but it helps move the load farther or faster.

Main idea: What is this reading mostly about?

Why it helps: How does this machine make work easier?

Check what you read. Write the letter in the box.

1. What is the fixed point that a lever turns around called?
   - **A** The fulcrum
   - **B** The effort
   - **C** The load

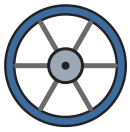
2. Where is the fulcrum on a seesaw?
   - **A** At the end where the effort is
   - **B** Between the effort and the load
   - **C** At the end where the load is

PREVIEW

Preview - Bright Path Sped

My name _____ Date _____

Reading 3: The Wheel and Axle



Read about the machine. Then write the main idea and why it helps.

A big wheel on a small rod

A wheel and axle is made of a large wheel joined to a smaller rod called the axle. They turn together around the same center. When you turn the large wheel, the axle turns with more force but over a shorter distance. A doorknob, a screwdriver handle, a faucet handle and a steering wheel all work this way. The bigger the wheel is compared with the axle, the greater the mechanical advantage. The ideal mechanical advantage is the radius of the wheel divided by the radius of the axle. The machine can also work the other way. When a motor turns the axle and the axle turns a large wheel, the wheel moves faster and farther, but with less force.

Main idea: What is this reading mostly about?

Why it helps: How does this machine make work easier?

Check what you read. Write the letter in the box.

1. What are the two parts of a wheel and axle?
   - **A** A large wheel and a smaller axle
   - **B** Two wheels of the same size
   - **C** A ramp and a rope

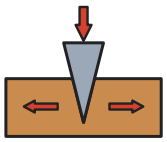
2. How do you find the ideal mechanical advantage of a wheel and axle?
   - **A** Wheel radius divided by axle radius
   - **B** Axle radius divided by wheel radius
   - **C** Wheel radius plus axle radius

PREVIEW

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My name _____ Date _____

Reading 5: The Wedge



Read about the machine. Then write the main idea and why it helps.

Two ramps back to back

A wedge is two inclined planes placed back to back. It has a thick end and a thin edge. When you push a wedge, it changes your force into a sideways force that pushes things apart. An axe splits a log, a knife slices bread, and a chisel cuts wood. A doorstop is a wedge too, but it works by pressing tight under a door. A thin wedge with a long, sloping side needs less force than a thick, blunt one, but it has to move farther to do the same job. For a wedge, the ideal mechanical advantage is the length of its slope divided by its thickness. A sharp edge is only a wedge that has been made very thin.

Main idea: What is this reading mostly about?

Why it helps: How does this machine make work easier?

Check what you read. Write the letter in the box.

1. What does a wedge do with the force you push with? ☐
   - **A** It turns it into a sideways force that pushes things apart
   - **B** It turns it into a spinning force
   - **C** It makes the force disappear

2. Which wedge needs less force? ☐
   - **A** A thin wedge with a long slope
   - **B** A thick, blunt wedge
   - **C** A wedge with no slope

PREVIEW

Preview - Bright Path Sped

My name _____ Date _____

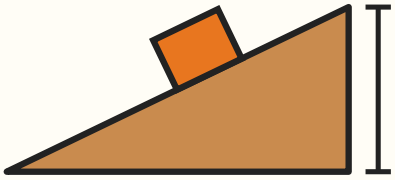
Name the Machine

Look at each picture. Write the name of the machine.

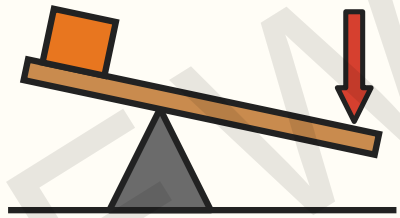
Each picture shows one of the six simple machines. Write its name in the box. The words in the bank can help.

wedge	lever	screw	wheel and axle	pulley	inclined plane

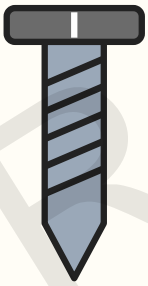
1



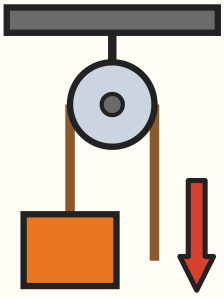
2



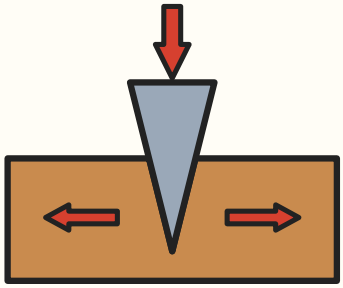
3



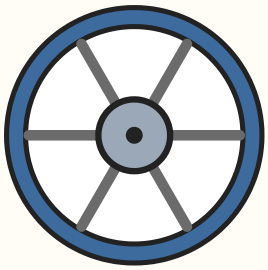
4



5



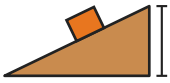
6



PREVIEW

My name _____ Date _____

Mechanical Advantage



Use the formulas. Solve each problem.

N means newtons, a unit of force. A bigger MA means the machine helps more.

Formulas

Mechanical advantage (MA) = load divided by effort

Ramp: ideal MA = length of the slope divided by height

Lever: ideal MA = effort arm divided by load arm

Wheel and axle: ideal MA = wheel radius divided by axle radius

Pulley: ideal MA = number of rope sections holding the load

1. A box that weighs 90 N is lifted with an effort of 30 N. What is the mechanical advantage? ____ MA

2. A ramp is 10 meters long and 2 meters high. What is its ideal mechanical advantage? ____ MA

3. A lever has an effort arm of 160 cm and a load arm of 40 cm. What is its ideal mechanical advantage? ____ MA

4. A wheel has a radius of 18 cm. Its axle has a radius of 3 cm. What is the ideal mechanical advantage? ____ MA

5. Two rope sections hold up the load in a pulley system. What is the ideal mechanical advantage? ____ MA

6. A load of 180 N is lifted with an effort of 20 N. What is the mechanical advantage? ____ MA

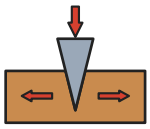
Show your work here.

PREVIEW

Preview - Bright Ezee Shed

My name _____ Date _____

Which Machine Is It?



Which machine is it? Write L, P, W, I, E or S.

L = lever P = pulley W = wheel and axle I = inclined plane E = wedge S = screw

Each one is a real tool or object. Decide which simple machine it is. Use the readings to help you.

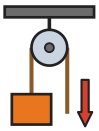
1. A seesaw
2. A rope over the top of a flagpole
3. A doorknob
4. A wheelchair ramp
5. An axe blade
6. A jar lid
7. A crowbar
8. A steering wheel
9. A playground slide
10. A doorstop
11. A bolt and nut
12. A pulley hung from a branch to lift a bucket

PREVIEW

Preview - Bright Path Sped

My name _____ Date _____

Quiz



Read each one. Write the letter of the best answer.

Take your time. Guess if you are not sure.

1. Which kind of pulley only changes the direction of a force?
   - **A** A fixed pulley
   - **B** A movable pulley
   - **C** A pulley system

2. A ramp is 6 meters long and 2 meters high. What is its ideal mechanical advantage?
   - **A** 4
   - **B** 3
   - **C** 12

3. Which simple machine is made of two inclined planes back to back?
   - **A** A screw
   - **B** A lever
   - **C** A wedge

4. A screw is an inclined plane wrapped around what?
   - **A** A post
   - **B** A wheel
   - **C** A rope

5. A load of 60 N is lifted with 20 N of effort. What is the mechanical advantage?
   - **A** 40
   - **B** 80
   - **C** 3

6. Which tool works as a lever?
   - **A** A jar lid
   - **B** A crowbar
   - **C** A doorstop

PREVIEW

Answer Key: Check, Readings, Quiz

The check, the 12 checks that follow the readings, and the quiz. If a student picks another letter, point to the sentence in the reading that settles it.

Readings: the checks pages 5 to 10

#	Reading	Answer
1	Lever	A: The fulcrum
2	Lever	B: Between the effort and the load
1	Pulley	A: It changes the direction of the …
2	Pulley	C: Twice as far as the load …
1	Wheel and axle	A: A large wheel and a smaller …
2	Wheel and axle	A: Wheel radius divided by axle radius
1	Inclined plane	A: A long, gentle ramp
2	Inclined plane	B: Length of the slope divided by …
1	Wedge	A: It turns it into a sideways …
2	Wedge	A: A thin wedge with a long …
1	Screw	A: A slanted ridge that winds around …
2	Screw	A: One with threads close together

Before and After Check page 4

#	Starts with	Answer
1	How many simple machines are …	B: Six
2	What do we call the …	A: The load
3	Which simple machine is a …	C: An inclined plane
4	What can a simple machine …	B: Change the size or direction …
5	Which simple machine is a …	A: A lever

Quiz page 17

#	Starts with	Answer
1	Which kind of pulley only …	A: A fixed pulley
2	A ramp is 6 meters …	B: 3
3	Which simple machine is made …	C: A wedge
4	A screw is an inclined …	A: A post
5	A load of 60 N …	C: 3
6	Which tool works as a …	B: A crowbar

PREVIEW

Answer Key: Sort, Cut and Paste, Written

The tool sort, the cut-and-paste mat (read each strip left to right, top row first; the pieces are not printed in box order), the main idea boxes on pages 5 to 10 and the design page. These are samples, not the only right answers.

Which Machine Is It? page 15

#	Starts with	Letter
1	A seesaw	L = lever
2	A rope over the top of …	P = pulley
3	A doorknob	W = wheel and axle
4	A wheelchair ramp	I = inclined plane
5	An axe blade	E = wedge
6	A jar lid	S = screw
7	A crowbar	L = lever
8	A steering wheel	W = wheel and axle
9	A playground slide	I = inclined plane
10	A doorstop	E = wedge
11	A bolt and nut	S = screw
12	A pulley hung from a branch …	P = pulley

Cut and Paste: Match the Tool page 18

Piece (row, column)	Box
r1 c1: A chisel cutting wood	Wedge
r1 c2: A claw hammer pulling a …	Lever
r1 c3: A ramp onto a loading …	Inclined plane
r2 c1: A screw holding a shelf …	Screw
r2 c2: A rope and wheel hoisting …	Pulley
r2 c3: A water faucet handle	Wheel and axle

Main idea and why-it-helps boxes

Reading	A good main idea box says	A good why-it-helps box says
Lever	A lever is a bar that turns on a fulcrum so that an effort can move a load, and there are three kinds.	It shows that a long lever makes a heavy job easier by spreading the effort over a longer distance.
Pulley	A pulley is a grooved wheel with a rope: a fixed pulley changes the direction of the force and a movable pulley cuts the effort.	It shows that a machine can help just by changing direction, and that a smaller effort costs more rope.
Wheel and axle	A wheel and axle is a large wheel joined to a small axle, and turning the wheel gives the axle more force.	It shows that doorknobs and faucet handles are machines, and that a bigger wheel gives a bigger advantage.
Inclined plane	An inclined plane is a sloping surface, and a longer, gentler slope needs less effort over a longer distance.	It shows that a ramp does not take away the work but spreads it out, so each push can be smaller.
Wedge	A wedge is two inclined planes back to back that turns a push into a sideways force that splits or cuts.	It shows that axes and knives are machines, and that a sharper, thinner edge needs less force.
Screw	A screw is a ramp wrapped around a post, so turning it many times turns a small force into a large one.	It shows that a jar lid and a bolt are machines, and that close threads trade more turns for less force.

Design a Machine (page 16): what to look for

- The drawing shows one of the six simple machines, with the effort and the load labeled.
- The how-it-helps box says what the machine changes: the size of the force, its direction, or the distance moved.
- There is no one right design. Accept any machine that fits the job the student named.

PREVIEW

Class Progress Grid

Every student on one grid: items right by page type.

Class or group _____ Month _____

Student	Check (of 5)	Readings (of 12)	Labels (of 15)	Math (of 12)	Sort (of 12)	Quiz (of 6)	Cut (of 6)

PREVIEW

How to fill this in

For each column, add up how many items that student has right with no prompt (the tracker rows). One glance across a row shows which skill is easiest and which is next.

Grouping for small-group time

Students low in Readings can start with the Lever reading (page 5) read aloud and the main idea boxes done together. Students low in Labels or Sort need Name the Machine (page 11) and the cut-and-paste mat (page 18). Students low in Math can work the first problem on page 13 together with the formula card. Students near full marks can move to the work page (14) and the design page (16). Use the check on page 4 before and after to see growth.

Riley's Tracker (Invented Student)

Riley M. is invented; nothing on this page describes a real student. The blank tracker is on page 22.

Student: Riley M. (an invented student)

Teacher: Ms. Patel (invented)

Month: September to October

Page	Page type and set	Items	Right	Date	Notes
4	Before and After Check	5	3	9/22	Guessed on question 4
5	Reading 1: The Lever	2	2	9/24	-
6	Reading 2: The Pulley	2	1	9/25	Said a fixed pulley halves the effort
7	Reading 3: The Wheel and Axle	2	2	9/26	-
8	Reading 4: The Inclined Plane	2	-	-	-
9	Reading 5: The Wedge	2	-	-	-
10	Reading 6: The Screw	2	-	-	-
11	Name the Machine	6	5	9/29	Wrote screw for wedge
12	Label the Parts	9	-	-	-
13	Mechanical Advantage	6	4	10/2	Divided effort by load on two problems
14	Work and Mechanical Advantage	6	-	-	-
15	Which Machine Is It?	12	9	10/6	Mixed up the wedge and the inclined plane
17	Quiz	6	-	-	-
18	Cut and Paste: Match the Tool	6	-	-	-

How to read it

Riley M. has done **7 of 14** scored pages and got **26 of 35** items right with no prompt. **2** pages were all right and **5** carry a note. Every number comes from the table.

What the table points to

The lowest page is Reading 2: The Pulley (1 of 2). That is where the next practice goes. The 7 pages left blank are not tried yet, never wrong.

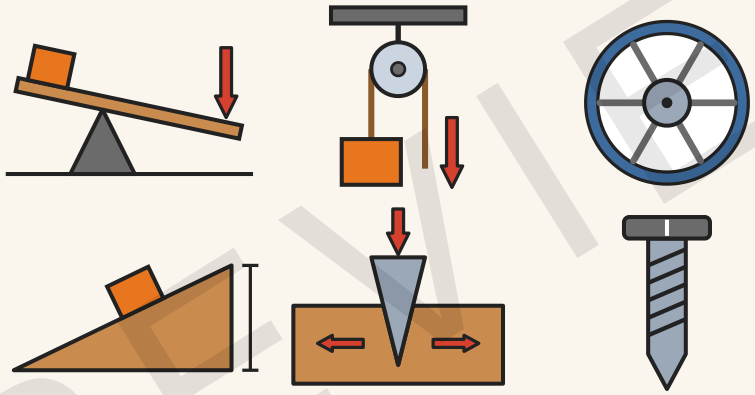
PREVIEW

Binder Cover

Slide this into the front of a binder. Type a name in the two fields or write it by hand. The divider tabs and a spine label to cut out are on the next page (page 28).

Science - Physical Science

SIMPLE MACHINES



Readings, Diagrams and Practice

Lever	**Pulley**	**Wheel and axle**
Inclined plane	**Wedge**	**Screw**

Teacher _____ Class or student _____

PREVIEW