Objectives:
Science TEKS
4.1(A)--Demonstrate safe practices during field and laboratory investigations.
4.2(A)--Plan and implement descriptive investigations.
4.2(B)--Collect information by observing and measuring.
4.2(C)--Analyze and interpret information to construct reasonable explanations from direct and indirect evidence.
4.2(D)--Communicate valid conclusions.
4.2(E)--Construct simple graphs, tables, maps, and charts to organize, examine, and evaluate information.
4.3(C)--Represent the natural world using models and identify their limitations.
4.4(A)--Collect and analyze information using tools.
4.4(B)--Demonstrate that repeated investigations may increase the reliability of results.
4.5(A)--Identify and describe the parts in nonliving systems.
4.5(B)--Predict and draw conclusions about what happens when part of a system is removed.
4.6(B)--Illustrate that certain characteristics of an object can remain constant even when the object is rotated.
4.6(C)--Use reflections to verify that a natural object has symmetry.
4.10(A)--Identify and observe effects of events that require time for changes to be noticeable.

TAAS Reading
1 Identify context clues.
3 Identify main idea of a selection (stated/paraphrased).

TAAS Mathematics
1.2 Compare and order whole numbers
4.1 Solve problems with metric and customary units and problems involving time.
5.2 Analyze data and interpret graphs (including line graphs).
10.1 Estimate with whole numbers.
11.1 Select strategies or solve problems using basic operations with whole numbers.
12.1 Formulate solution sentences.
12.2 Interpret charts, picture graphs, and bar graphs and use the information derived to solve problems.

TAAS Writing
Background Information: Before learning about simple machines, students should understand some of the principles that make machines work: force, friction, work, energy, and power.

Forces cause things to move, stop, or change shape or direction. A force is basically a push or a pull that makes an object move. Every machine needs a force to make it work. A machine is designed so that exactly the right amount of force produces the right amount of movement where it is needed.

Time Frame: 5-10 minutes per day

Materials:
- Student Packets
- Paper bags or plastic lunch-type bags (1 for each group of 4 students)
- *10-20 straws per group
- *Ping-Pong ball (1 per group)
- *Tennis ball (1 per group)
- *Baseball (1 per group)
- *Small ball (one from a jacks set or similar size--1 per group)
- *Small toy car (1 per group)
- *Large pencil erasers (2 per group)
- *Checker pieces (2 per group)
- *Centimeter rulers--wooden or thick plastic, if at all possible (1 per student)
- *10-20 large paper clips per group
- *Linking cubes (20 per group)
- *Feathers (about 5 per group)
- *Tape measure (1 for each group)
• *Large screws--at least 5-8 cm long (4 for each group)
• *Rolls of transparent tape (1 for each group)
• *Toilet paper tubes cut in half the long way (½ tube per student)
• *String, 100 cm long (1 piece for each student)
• *String, 30 cm long (1 piece for each student)
• *Snack-size baggies (1 for each student)
• Large paper clips (10 per student)
• Strips of heavy cardboard, 15 cm x 60 cm (1 per group)
• Balancing Clown Pattern (1 for each student)
• Gear Patterns (1 for each student)
• Crayons (for graphing)
• 2 brooms
• A length of soft rope (about 4-5 meters long)
• Pencils
• Scissors
• Tote trays or plastic tubs (1 per group)
• Large Sheets of Sandpaper (2 per group)
• Card stock
• Baggies
• Pennies (about 20 per group)
• Index cards
• Push pins (3 per student)
• Meat trays (1 per student)
• Hole Punch

Advance Preparation:
1. Duplicate copies of the student packets for each student.
2. Duplicate a copy of The Balancing Clown (Appendix 1) on card stock for each student.
3. Duplicate a copy of the Spiral Pattern (Appendix 1) on regular duplicating paper for each student.
4. Duplicate a copy of the Gear Pattern (Appendix 1) on card stock for each student.
5. Use the hole punch to punch a hole through both sides of a snack-size baggie. Put the 10 large paper clips in the baggies.
6. Fill a bag for each group. Use the starred objects listed above.
7. Divide each tote tray in half lengthwise. Cover half of the tote with sandpaper. Tape.
8. Divide the class into groups of four.
Week 1, Day 1
Ask, *Why do things move? Speed up? Slow down?* (Because forces are acting on objects) How can we tell that forces are acting on objects? (Because they move, stop, change direction, etc.)

Have the students take the straws out of the bags and ask, *How many ways can you use a straw to make things move?* Tell them to take other items (of their choice) out of their bags and devise different ways of moving them. Tell the students to record their findings on their warm-up sheets. In the follow-up discussion, ask students to relate their findings. Let them make suggestions about why things failed to move as well as talking about their successes.

Week 1, Day 2
Briefly review what the students did on Day 1. Discuss the various methods the students used to move objects with straws. Ask each student to select one method he/she used and three different objects. Have them devise a way of measuring the force used to move the object, i.e., if they blow through the straw to move the objects, count how many breaths they would have to take to push the objects 150 centimeters. Let each group measure a 150 cm track on a table or the floor and try to move their three objects along the track. Have the students make a graph of their results on their warm-up sheets. Remind the students to give their graph a title and to label each axis.

Week 1, Day 3
Have students answer the questions using the graphs they made on Day 2.

Week 1, Day 4
Students have been talking about forces for several days and the terms *push* and *pull* should have occurred in their discussion. Let the students look at the pictures on Day 4 of their warm-up sheets. Have them identify the forces being used as a *push*, a *pull*, or both. After students have completed labeling the pictures, discuss. (Answers may vary. Accept any answer a student can justify.)

Week 1, Day 5
Have students answer the questions for Day 5. Discuss. (Answers: #1--G and #2--B)
Week 1, Day 1  
List the objects you made move with your straw.

How did you use the straw to move the objects?

Week 1, Day 2

Week 1, Day 3
1. Which object took the fewest breaths to move? __________
2. Which object took the most breaths to move? ______________________
3. How many more breaths did it take to move the object with the most breaths than the object with the fewest breaths? __________
Week 1, Day 4

Label each force pictured below: push, pull, or both.

- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]

Week 1, Day 5

1. Jenna pushed the small ball 134 cm with two breaths. What other information is needed to determine how far the ball went on Jenna's second breath?
   F  The weight of the ball
   G  The distance the ball traveled on her first breath
   H  The number of breaths Jenna took
   J  The size of the ball

2. Brandon moved his toy car a total of 92 cm with 2 breaths. With his first breath, he moved the car 58 cm. Which is the best estimate of how many centimeters the car moved on his second breath?
   A  20
   B  30
   C  40
   D  50
Week 2, Day 1
Have the students read and answer the questions on the student page. Briefly discuss the effects of friction on moving objects.
(Possible answers: Warm or hot; no; yes--a push; friction)

Week 2, Day 2
Tell students to read the passage and answer the questions. Encourage them to use the appropriate reading strategies to find the answers. (Answers: #1-B and #2-H)

Week 2, Day 3
Assign the members of each team one of the following jobs:
1. Holder--This person holds the tote tray at an angle to the table.
2. Measurer--This person measures to make sure one end of the tote tray is 20 cm above the top of the table.
3. Slider--This person releases the objects to slide down the tote tray.
4. Observer--This person watches the objects to see which reaches the bottom first. Tell the students to perform the investigation as stated on the warm-up sheet. Discuss the students' results.

Week 2, Day 4
Let students read the paragraph and answer the question. Discuss. (Answer--Friction)

Week 2, Day 5
Let students solve the problems independently. Discuss. (Answers-- #1-C and #2-J)
Week 2, Day 1

Rub your hands together very quickly for 10 seconds.

How do your hands feel? _____________________________

Make a train of 6 linking cubes and put them on your table. Gently push the blocks so that they move a short distance. Do the blocks keep moving on their own? ________

Does it take a force to make the blocks move? ________ What force? ________________

What is the force called that makes the blocks stop moving? ________________________

Week 2, Day 2

Friction is a force that resists, or stops, motion whenever the surfaces of two objects move against each other or when an object moves through a liquid such as water or a gas such as air. Friction tends to make movement more difficult. Therefore, you can never get the same amount of work from a machine as you put into it. People who design and engineer machines try to overcome friction in order to make the machines as efficient as possible. There is much less friction between smooth surfaces than between rough surfaces.

Without friction a parachute would fall straight to the ground, the tires on a car would spin uselessly without gripping the road, and an eraser wouldn't remove a pencil mark.

1. In this passage, the word resists means--
   A moves forward
   B stops
   C speeds up
   D keeps going

2. What is this passage mostly about?
   F You can never get the same amount of work from a machine as you put in it.
   G Without friction an eraser wouldn't remove a pencil mark.
   H Friction is a force that slows down motion between two touching objects.
   J There is less friction between smooth surfaces than rough surfaces.
Engineering in A Bag
Daily Warm-ups

**Week 2, Day 3**
Lift one end of the tote tray and hold it 20 cm above the top of the table keeping the other end on the table. Measure to make sure it is 20 cm off the table. Take 2 erasers, 2 large paper clips, and 2 checker pieces out of the bag.

1. Put the two erasers at the top of the tote tray and let go at the same time. Did the erasers get to the bottom at the same time? If not, on which side did the object reach the bottom first?

2. Release the 2 large paper clips at the same time. What happened?

3. Release the 2 checker pieces at the same time. What happened?

4. Why do you think it made a difference which side of the tote the object was on?

**Week 2, Day 4**
A perpetual motion machine is one that would never stop working once it was set in motion. Such a machine would not need an outside source of energy. It could produce its own energy forever. Such a machine does not and cannot exist because of one force of nature. What is that force?

**Week 2, Day 5**
1. When Randall rolled a toy car on the tile floor, it went 206 cm before friction caused it to stop. When he rolled the car on a carpeted floor, it stopped after rolling 138 cm. Which could be used to find how many more centimeters the car rolled on the tile floor than the carpeted floor?
   - A 206 ÷ 138
   - B 206 x 138
   - C 206 - 138
   - D 206 + 138

3. Katie is doing a science fair project on friction and different surfaces. She began working at 4:15 yesterday. If she worked on her project for 35 minutes, at what time did she stop working?
   - F 3:40
   - G 4:30
   - H 4:45
   - J 4:50
Week 3, Day 1
Call on a student to stand up and jump up as high as he/she can. Discuss what happens. Ask, *Why is it that when we jump up we always finish by going down towards the ground? Why don't we shoot off into the sky when we bounce on a trampoline?* Write the word *gravity* on the board. Say, *Gravity is the force that pulls all objects down and keeps us on the earth.* Have students complete the activity for Day 1. (If students have trouble designing an experiment, guide them to having the tallest person drop the balls while the others watch them hit.) Discuss.

Week 3, Day 2
Say, *Yesterday we saw how gravity pulled objects down to the Earth. Does everything always fall straight down? Does rain? Why or why not?* Have students complete the investigation for Day 2. Discuss.

Week 3, Day 3
Tell the students to read the passage and answer the questions. (Answers: #1--F and #2--C) Discuss.

Week 3, Day 4
Have students try the first part of Day 4. Say, *All objects have a balancing point called the center of gravity. When you sit with your arms folded, you put your center of gravity over the seat of the chair. You cannot stand unless you lean forward and shift the center of gravity over your feet.* Give each student a copy of The Balancing Clown. (See the Appendix, page .) Tell them to follow the directions for the rest of Day 4. Discuss.

Week 3, Day 5
Have students answer the questions. (Answers: #1--C; #2--G; and #3--B) Discuss.
Name ____________________________ Date ________________

**Week 3, Day 1**

Which do you think will fall faster, a tennis ball or a baseball? ________________

How could you find out? Design an experiment to find out. Which one landed first? ________________

Try the experiment again. Did you get the same results? ________________

Try the experiment with a small, jacks ball and a baseball. What happened? ________________

Do it again. Do you get the same results? ________________

Why do you think this happened? ________________

**Week 3, Day 2**

Have one person in the group drop a feather. How can you change the path of the falling feather? ________________

Brainstorm some other ways to change the path of falling objects. List the ways: ________________

Complete the sentences below.

1. Because of gravity ________________

2. The path of falling objects can be changed by ________________

**Week 3, Day 3**

Astronauts "grow" two or more inches while in space. Their spines stretch out when they're weightless, giving them extra height. When they get back to Earth, they shrink back to their usual size again. One very tall astronaut on the space shuttle grew too much--in space he was taller than the maximum height allowed for astronauts.

1. What is a good title for this passage?
   - F The Man Who Grew Too Much
   - G The Famous Shrinking Astronauts
   - H Why People From Other Worlds are Tall
   - J Fun on the Shuttle

2. In this passage the word maximum means--
   - A smallest
   - B length
   - C greatest
   - D weight
Sit in your chair. Keep your back flat against the back of the chair. Cross your arms and hold them against your chest.

Stand up **without** leaning forward. What happened?

Sometimes the **center of gravity** is not in the center of the object. Cut out your balancing clown. Balance your clown on the tip of your finger. Will it balance? You might have to add weight somewhere on the clown to make it balance. Try putting some paper clips on the clown. Where do you think you should put the paper clips?

Test your predictions. Were you right? Move the paper clips around until the clown balances. Draw a picture in the space below showing where you put the paper clips to make your clown balance.

---

1. I make plant roots grow down. I keep things from falling off the earth. I make balls bounce. What am I?
   - A inertia
   - B force
   - C gravity
   - D electricity

2. Seymour wants to measure the force of gravity on a book. What instrument should he use?
   - F thermometer
   - G scale
   - H measuring cup
   - J meter stick

3. Angela is raising four horses for her 4-H Project. Yesterday the vet weighed her horses. Smokey weighed 865 pounds. Laramie weighed 967 pounds. Thunder weighed 766 pounds, and Duncan weighed 964 pounds. Which shows the weight of her horses in order from **least to greatest**?
   - A 865 967 766 964
   - B 766 865 964 967
   - C 967 964 865 766
   - D 766 964 967 865
Assign the following jobs to members of each group:
(a) Roller--one who places the car on the inclined plane;
(b) Measurer--one who measures the distance the car travels;
(c) Releaser--one who lets the car roll; and (d) Observer--one who marks the spot where the car stops. Monitor as students perform the investigation. Discuss students' answers as time permits.

Review the activity from Day 1. Have the students make a bar or line graph illustrating the results of their investigations. Discuss.

If necessary, review with the students what variables are in the experiment. Have the students answer the question. Brainstorm ways to change the variables in the experiment.

Have students read the question and circle the forces that would affect a marble moving on the inclined plane. Have the students justify or explain their answers.

Point out the chart to the students. Ask them how it compares to the graphs that they made on Day 2. Tell them to use the chart to solve the problems. (Answers: #1--B and #2--H)

Discuss the problems with the students.
Week 4, Day 1

You need a ruler, a tape measure, a heavy cardboard strip, and the small, toy car to perform this investigation. Stack some books to make a tower that is 20 cm tall. Make an inclined plane by leaning the heavy cardboard strip against the edge of the books. The roller holds the car at the top of the ramp. The releaser holds the ruler across the inclined plane to make a starting gate. Lift the ruler straight up and let the car roll. DO NOT PUSH THE CAR! How far did the car roll? __________ cm Put more books in the stack so that it is 30 cm tall. Release the car and measure the distance again. How far did the car go this time? _______ cm Do it one more time from the top of a stack that is 40 cm tall. How far did the car go? _______ cm What was the only thing that was changed each time? ____________________________ Why did the car travel different distances each time? ______________________________

Week 4, Day 2

Make a graph using the data you collected on Day 1 of this week.

Week 4, Day 3

Think back to rolling the car down the inclined plane on Day 1. What are two variables (things you can change in the experiment) that might change the distance the car travels?
Week 4, Day 4

Which of the following forces would affect the way a marble moves on an inclined plane? Circle your answer(s).

- gravity
- magnetism
- friction
- electricity
- push
- buoyancy
- pull
- inertia

Week 4, Day 5

The chart below shows how far a toy car traveled after coming down an inclined plane set at different heights.

<table>
<thead>
<tr>
<th>Height of Inclined Plane</th>
<th>Length of Inclined Plane</th>
<th>Distance Traveled</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 cm</td>
<td>50 cm</td>
<td>55 cm</td>
</tr>
<tr>
<td>40 cm</td>
<td>50 cm</td>
<td>72 cm</td>
</tr>
<tr>
<td>60 cm</td>
<td>50 cm</td>
<td>78 cm</td>
</tr>
</tbody>
</table>

Use the chart to answer the questions below.

4 Which is the best estimate of how many more centimeters the car traveled from a height of 60 cm than a height of 55 cm?
- A 10 cm
- B 20 cm
- C 30 cm
- D 40 cm

4 When performing the investigation, Alexander decided to use an inclined plane that was 70 cm long and 40 cm high. What other information is needed to decide if it is better to have a 70 cm long inclined plane or a 50 cm long inclined plane?
- F The height of the inclined plane
- G The length of the inclined plane
- H The distance the car traveled
- J The weight of the car
Tell the students to take the screws out of their bags. Have the students examine the threads of the screws, especially noticing how the threads spiral up from the point to the top of the screw. Have each student place two fingers at the base or tip of the screw and turn the screw clockwise with the other hand to feel how the screw moves downward. Ask students if they notice any similarity to another simple machine they have talked about. (inclined plane) Tell the students that a screw is really an inclined plane wrapped around a cylinder. Have the students answer the questions in their student packet. (Answers: #1--words will vary; #2--wrap an inclined plane around a central post or cylinder; #3--answers will vary.

Give each pair of students a sheet of duplicating paper cut in half (21 ½ cm by 14 cm). Tell the students to follow the directions for Day 2. Ask, What kind of simple machine does this triangle look like? (inclined plane) Say, We are going to use this inclined plane and a pencil to make another kind of simple machine. Starting with the shortest side of the triangle against the pencil, wrap the paper around the pencil keeping the bottom edge even. Be sure that the colored part of the paper is showing. Tape the end. What kind of simple machine do you think this is? (screw) A screw is really an inclined plane wrapped around a center pole or cylinder.

Have the students cut out the spiral shape (See Appendix 1). Tell them to tape the outside end of the spiral to their desk or table. Have them answer the questions on Day 3 of their packet. Discuss their answers. (Possible Answers--#1--inclined plane or screw; #2--parking ramps, circular staircases, circular slides on the playground, etc.; #3--it takes up less space than a straight ramp; #4--a winding road, it takes less energy than a straight road)

Tell the students to read the paragraph and answer the questions. (Answers: #1--D and #2--A) Discuss.

Tell the students to look around them to see where screws are being used. Have them follow the directions for Day 5. Discuss.
Week 5, Day 1

1. List at least five descriptive words that tell about the screw.

2. How is a screw made?

3. What are some uses for screws that you can see around you?

Week 5, Day 2

Use a ruler to draw a diagonal line on the rectangle and cut along the line. Each partner should have a right triangle. Color a dark line (about 1 cm wide) along the cut edge of the triangle. What kind of simple machine does this triangle look like? ________________ Put your thumb on the line at the bottom. Rotate the pencil, keeping your thumb on the line. What happens? ________________ What kind of simple machine did you make? ________________ A screw is really an ____________________ wrapped around a _____________________.

Week 5, Day 3

1. Pull straight up on the middle of the spiral. What simple machine does this look like? ________________

2. Have you ever seen an inclined plane that looks like this? ________________

3. Why might this special kind of inclined plane (a screw) be used instead of a regular inclined plane? ________________

4. Would you rather ride your bicycle straight up the side of a mountain or follow a spiral road like the threads of a screw up the mountain? ________________
Week 5, Day 4

A screw is an inclined plane that has been wound in a spiral around a cylinder. If you follow the thread from the tip of a screw, you will see an inclined plane constantly curving upward around a central shaft. Like other inclined planes, it is a simple machine that reduces the effort needed to complete a job. With the screw, as with other simple machines, you do a little work over a long distance so that the machine can do a lot of work over a short distance. A screw has many practical applications. It is used to hold materials together; it opens and closes nearly all vises. A screw is also used in drilling tools. In the form of a propeller, a screw can even help produce motion in a boat or an airplane.

1. What is a screw?
   A  A type of force
   B  A cylinder
   C  A special type of pulley
   D  A special type of inclined plane

2. In this selection, the word applications means--
   A  uses
   B  sizes
   C  simple machines
   D  materials

Week 5, Day 5

Draw to show two places that you found screws holding things together. Write to tell what is held together.
Week 6, Day 1

Give each group a wooden block or a large Lego® block. Have them perform the investigation for Day 1. Have the students compare and contrast the amount of work they did lifting the book with their hands and lifting the book with the lever. Point out that the block represents the turning point or fulcrum of the lever. The fulcrum is the place where the downward push changes into an upward force. The book in this investigation is the load and the push down on the ruler is the force.

Week 6, Day 2

Have students perform the investigation and discuss. Make sure the students understand that a longer distance from the fulcrum to the force makes it easier to pick up the heavy book, while a short distance from the fulcrum to the force makes it difficult.

Week 6, Day 3

Give each student 3 pennies. Monitor as they perform the investigation for Day 3. Ask, What happened when you put a penny on one end of the ruler? What happened when you put a penny on each end of the ruler? Have the students put a second penny on one end of the ruler. Discuss what happens and why it happens. Have the students find ways to balance the seesaw without adding any more coins. Discuss if time permits.

Week 6, Day 4

Tell the students to look at the picture and answer the question. (Answer: A heavy person has to sit closer to the middle of the seesaw to balance a lighter person on the other end.

Week 6, Day 5

Have students fill in the blanks for Day 5. Discuss. (Answers: #1--Larry; #2--B, yes, by having the large child sit close to the fulcrum while the other children sit close to the opposite end of the seesaw.
**Week 6, Day 1**

Each group needs a ruler, a dictionary, and a large Lego® block or wooden block to perform this investigation. Lift the book with your hands. Is it heavy? Balance the ruler across the block to make a lever. The ruler should rest across the block close to one end. Place the book on the end of the ruler nearest the block. Press down gently on the other end of the ruler. Was it easier to lift the book using your hands or with the lever?

---

**Week 3, Day 2**

Each person needs a ruler and a math book to perform this investigation. Place the ruler perpendicular (at a right angle) to the edge of the table or desk with about 5 cm sticking out over the edge of the table. Center your math book on the opposite edge of the ruler at the 20 cm mark. Push down on the end of the ruler hanging out over the edge of the table. Is it very easy to lift the book? Pull the ruler with the book on it so that about 10 cm of the ruler extends over the edge of the table. Try to lift the book with the ruler now. Is it harder or easier to lift the book? Pull the ruler with the book on it so that about 15 cm of the ruler is sticking out over the edge of the table. Try to lift the book with the ruler now. Is it harder or easier to lift the book? If you have a heavy load to lift, should you use a long lever or a short lever? Why?

---

**Week 6, Day 3**

Follow the directions below to make a model seesaw.

1. You need to a paper tube cut in half, a ruler, and 3 pennies.
2. Place the paper tube flat side down on your desk or table.
4. Put a penny on one end of the ruler. Observe what happens.
5. Now put a penny on the other end of the ruler. Observe what happens. (Discuss with your class what happens.)
6. Put a second penny on one side of the ruler.
7. Find a way to balance the seesaw without adding any more pennies.
8. How did you make the seesaw balance with one penny on one end and two pennies on the other end? Draw a picture below to show what your balanced seesaw looked like.
What is wrong with the picture below? Draw a ring around the fulcrum of the lever.

1. Larry and Lori are sitting on a seesaw. Larry weighs 150 kg and Lori weighs 120 kg. If the seesaw is evenly balanced, who is sitting closer to the fulcrum? ________________

2. Four children were playing on the seesaw. Three of the children were very small. Each of the small children weighed between 30 and 40 pounds. The largest child weighed about 90 pounds. Which is a reasonable total for the combined weight of the three small children?
   A  Less than 90 pounds
   B  Between 90 and 120 pounds
   C  Between 120 and 150 pounds
   D  Between 150 and 211 pounds

Could the larger child balance the three smaller children on the seesaw? __________

How could they make the seesaw balance? ________________________________
Monitor as the students perform the investigation for Day 1. Discuss their results.

Remind students that wheels are used in many ways. Brainstorm a list of machines with wheels. Give each student an index card. Have them write the name of a machine that has wheels on the card. Have the students tell what machine they wrote and sort the machines according to the number of wheels each machine has.

Give each student a copy of the Gear Pattern duplicated on card stock, a blank piece of card stock, a meat tray, and three pushpins. Have the students glue the Gear Pattern page to the blank piece of cardstock and cut out the gears. Ask them to place the largest gear on the meat tray and put a pushpin through the center. Have the students pin the smallest gear next to it so the "teeth" (cogs) interlock. (Keep the medium gear for Day 4.)

Have the students answer the questions for Day 4. Discuss.

Have students match the object to the type of simple machine it represents. Discuss.
Name ___________________________ Date ____________

**Week 7, Day 1**

Tie a piece of string around your mathematics book. Hold the free end of the string and pull the book across the table. Next, place three round pencils under the book. Try pulling the string now keeping the pencils under the book. Is it harder or easier to pull the book now? __________________________ Why do you think this is so? __________________________

**Week 7, Day 2**

Draw a picture of a machine that has wheels.

How does this machine make your work easier? __________________________

**Week 7, Day 3**

Listen carefully as your teacher gives you directions. You are going to be making some special wheels called gears. When you have finished doing what the teacher says, write your name on your machine and save it for Day 4. Draw a picture of the machine you made in the space below.
Week 7, Day 4

Rotate the big gear on your gear train clockwise. What happens to the small gear? 

Turn the big gear clockwise 3 times. How many times does the small gear go around while the big gear goes 3 times?  

Put the medium gear on the other side of the small gear. Does the third gear rotate when you turn the first gear? How does its movement compare to the second gear?  

Which direction do the gears turn?  

Do they all turn in the same direction?  

Week 7, Day 5

Match the following by drawing lines from the simple machine on the left to its real world use on the right.

- wheel and axle  
- wedge  
- inclined plane  
- lever  
- snow shovel  
- wheelchair ramp  
- doorknob  
- knife
Week 8, Day 1
Have one student hold a broom parallel to the floor. Have another student hold a second broom about 18 inches away from and parallel to the first broom. Tie one end of the rope length to the first broom handle; then loop the rope around both brooms three times. Have a third student slowly pull the loose end of the rope, while the other two students attempt to keep the brooms apart. Discuss, The brooms were hard to keep apart because pulling the rope exerted force on them. Broom handles with a rope looped around them work like a pulley. Pulleys decrease the amount of work needed to lift something. Fishing reels, curtain rods, elevators, and flagpoles have pulleys. Have students answer the questions for Day 1. Discuss.

Week 8, Day 2
Have students read the passage for Day 2. Discuss. (Answers: #1--C; #2--F; #3--C)

Week 8, Day 3
Monitor as students perform the investigation. Discuss their results.

Week 8, Day 4
Have students solve the problems. Discuss. (Answers: #1--B; #2--B)

Week 8, Day 5
Students are to list the six simple machines they have studied in any order. The examples of the machines will vary. Discuss as time permits.
Week 8, Day 1

1. Why was it hard to keep the brooms apart?

2. What type of simple machine works in a similar way?

Week 8, Day 2

A pulley is a small wheel with a groove in the rim in which a rope or belt moves. When a heavy object is fastened to one end of the rope, it can be lifted by pulling on the other end. It is useful because pulling a rope down is more comfortable than lifting an object up, but actually the pulley has only changed the direction of the effort. To raise a heavy object up, we must pull the rope down two feet. When a force is applied to the rope, the rope will move twice the distance that the weight moves, but you only need to apply half as much effort.

1. What might be a good title for this passage?
   A  Hard to Move Objects
   B  Applying Force
   C  How a Pulley Works
   D  Pulling A Rope

2. The word fastened in this passage means--
   F  tied
   G  looped
   H  lifted
   J  pulled

3. You can tell from the story that using a pulley probably--
   A  makes it harder to lift objects
   B  makes you work when you lift a heavy object
   C  makes it easier to do some kinds of work
   D  takes a lot of rope
**Week 8, Day 3**

You need a pencil, a 30 cm length of string, the baggie with the large paper clips and some tape. Tie one end of the string to the baggie securely. Tape the other end of the string around to the middle of your pencil. Hold the pencil on the ends and slowly spin it. What happens? 

What kind of simple machine did you make?

---

**Week 8, Day 4**

1. Terry made 2 pulleys to use in his invention. One pulley used a string that was 52 centimeters long, and the other pulley used a string that was 119 centimeters long. What was the difference in the lengths of the 2 pieces of string?
   - A 57 cm
   - B 67 cm
   - C 134 cm
   - D 171 cm

2. Frank, Stan, Richard, and Peter were using a pulley to lift some buckets filled with sand. Frank lifted more sand than Stan. Stan lifted less sand than Richard. Peter lifted more sand than Frank. Which is a reasonable conclusion?
   - A Richard lifted the least amount of sand.
   - B Peter lifted more sand than Stan.
   - C Richard lifted the most sand.
   - D Frank lifted less sand than Stan.

---

**Week 8, Day 5**

List the six simple machines. Give an example of each one.

1. 

2. 

3. 

4. 

5. 

6. 

Page 16
Week 9, Day 1
Answers: #1--lever; #2--wheel and axle; #3--inclined plane; #4--screw; #5--wedge

Week 9, Day 2
Answers: #1--wheel and axle; #2--wedge; #3--pulley; #4--inclined plane; #5--screw

Week 9, Day 3
Answers: #1--lever; #2--lever; #3--pulley; #4--inclined plane; #5--inclined plane.

Week 9, Day 4
Answers: #1--wedge; #2--screw; #3--screw; #4--wheel and axle; #5--pulley.

Week 9, Day 5
Play "I Spy" in the classroom. Use clues that will have students identify various simple machines in the room. For example, "I see a simple machine. It helps me open the door. What is it?" (door knob/wheel and axle)
You will be answering some simple machine riddles this week. Think carefully about what you have learned and how simple machines can be used to help us do work.

**Week 9, Day 1**

1. I am a simple machine. I am a bar resting on a turning point. I make lifting objects easy. What am I?

2. I am a simple machine. I am a wheel that turns on a rod. I make carrying objects from one place to another easy. What am I?

3. I am a simple machine. I am a plane that is tilted and connects a lower level to a higher level. I make getting things to a higher place easier. What am I?

4. I am a simple machine. I hold objects together. I turn and turn until I tightly hold them together. What am I?

5. I am a simple machine. I have a sharp edge. I help cut things. What am I?

**Week 9, Day 2**

1. I am a simple machine. I help cars, trucks and vans roll smoothly on roads. What am I?

2. I am a simple machine. I make it easy to slice bread. What am I?

3. I am a simple machine. I make it easy to get a flat to the top of the flag pole. What am I?

4. I am a simple machine. I make it easy to get a heavy box into a truck. I make it easy to get a wheelchair into a building. What am I?

5. I am a simple machine. I hold pieces together on your bicycle and your desk at school. What am I?
Week 9, Day 3

1. I am a simple machine. I am one of the oldest and simplest machines. I am a bar that helps people lift heavy objects. I help pry open cans of paint. What am I?

2. I am a simple machine. You use me when you seesaw, use a paint brush, sweep the floor with a broom or shovel up dirt. What am I?

3. I am a simple machine. I am a wheel with a rope wrapped around me. I help open curtains or mini-blinds. What am I?

4. I am a simple machine. I am like the lever because I help move heavy objects. Long ago the Egyptians used me to move heavy stones to build the pyramids. What am I?

5. I am a simple machine. You use me on the playground when you slide down the slide. You use me when you walk up or down stairs. What am I?

Week 9, Day 4

1. I am a simple machine. I am a type of inclined plane. I force objects apart or hold them together. I can be used to split firewood. I can be used as a doorstop. What am I?

2. I am a simple machine. I am another type of inclined plane. I go around a center pole. I am very useful. I hold things tighter than nails because I must be twisted to go in or out of an object. What am I?

3. I am a simple machine. Cars can move up and down a steep mountain at safe speeds when traveling on a road that spirals from top to bottom. I am a type of inclined plane. What am I?

4. I am a simple machine. I am one of the most important inventions of all time. I was first used as a rolling log. I make it easier and faster for objects to move. I am in clocks. What am I?

5. I am a simple machine. I lift objects and move them from place to place. One end of a rope is wrapped around the wheel and the other end is attached to an object. Skiers use me to get to the top of mountains. What am I?
Balancing Clown Pattern, Week 3--Day 4
Spiral Pattern, Week 5, Day 3
Resources--Teacher Books:


Candelora, Deborah M. *Learning Center Activities: Science.* Huntington Beach, CA: Teacher Created Materials, 1996.


Engineering in A Bag
Daily Warm-ups


*Resources--Student Books:*

*Resources--Internet Web Sites*
http://www.exc2.net/kedt/asasite/ELEMENTARY.htm

http://zeus.gac.peachnet.edu/henry-schools/cur/simpmach.htm
Engineering in A Bag
Daily Warm-ups

Warm-up Plan for Grades 3-4
Week 1--forces and motion
Week 2--friction
Week 3--gravity
Week 4--inclined plane
Week 5--wedge/screw
Week 6--lever
Week 7--wheel and axle
Week 8--pulley
Week 9--design brief

Warm-up Plan for K-2
Week 1--work and energy
Week 2--forces and motion
Week 3--friction
Week 4--gravity
Week 5--inclined plane
Week 6--wedge
Week 7--wheel and axle
Week 8--lever
Week 9--design brief