MAGNIFICENT MACHINES

UNIT OVERVIEW

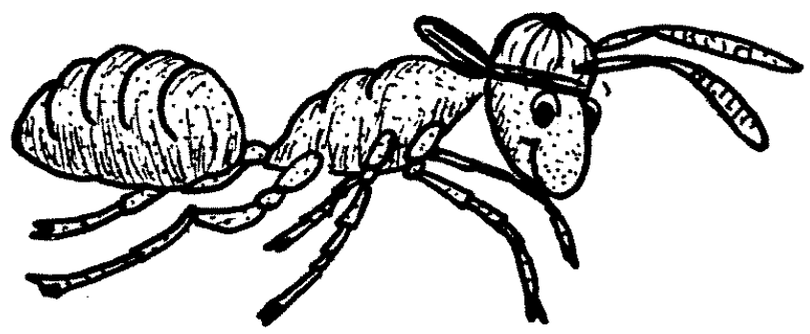
"Hands-on" is definitely the order of the day as students inquire into and investigate the magnificent world of machines. Student notes explain the six simple machines (inclined plane, wedge, screw, lever, wheel and axle, pulley). Related teacher demonstrations and simple-to-do student activities and discovery sheets accompany these core lessons. Student notes are included for possible enrichment lessons dealing with gears, hydraulics, and how a car works. More involved, optional assignments stress creative and critical thinking in addition to building a degree of flexibility into the unit. From now on, teaching about machines will no longer be mundane - it will be magnificent!

STUDENT ASSIGNMENTS AND ACTIVITIES

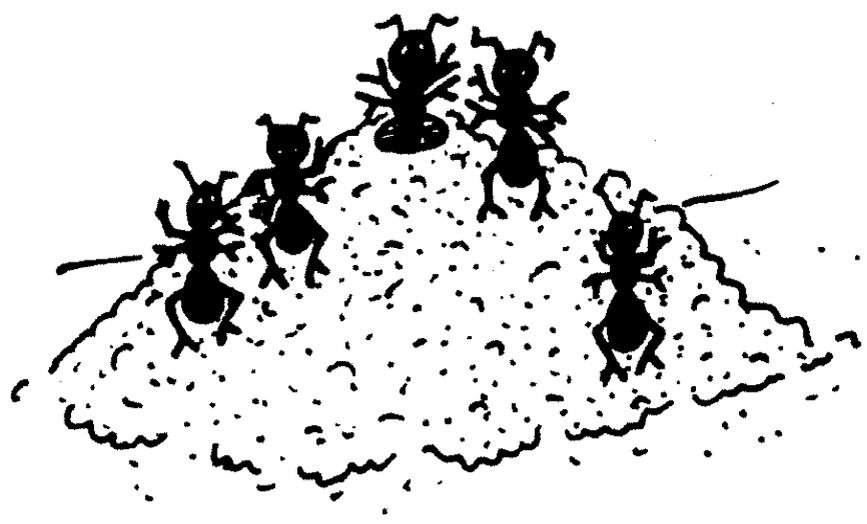
1. **Introductory Lesson** - Machines Wordsearch
2. **Inclined Plane** - Arny Builds A Pyramid - Ant Hill Gang Discovery Sheet
3. **Wedge** - Machine Collage
4. **Screw** - Amy's Way Home - Ant Hill Gang Discovery Sheet
5. **Lever** - Lever Fever - Ant Hill Gang Discovery Sheet
6. **Wheel and Axle** - Water From The Well - Ant Hill Gang Discovery Sheet
7. **Pulley** - Pulley Power - Ant Hill Gang Discovery Sheet
8. **Gears and Hydraulics** - Machines at Work - Identifying Simple Machines
9. **How A Car Works** - Crazy Cars - Enrichment Crossword

OPTIONAL ACTIVITIES

1. **Review**
2. **Lazzzzy!**
3. **Useless Invention**
4. **Famous Inventor Report**
5. **Machine Pictograms**



"Ant Hill Gang"



ANT HILL GANG DISCOVERY SHEETS

The Ant Hill Gang and the related discovery sheets help to motivate students with hands-on problems that students help to solve. Throughout the unit, various concepts are approached by having students develop and build solutions using their knowledge of machines to help out the members of the Ant Hill Gang. Arny the Ant needs help building a pyramid, Amy (Arny's kid sister) needs a spiral built to help get home, Alice Ant needs help moving a large boulder, Albert needs help getting water out of the well, while Adam Ant needs help getting friends up a steep cliff. The discovery sheets contain hands-on instructions for students on how to build devices that can get the job done and make learning enjoyable at the same time.

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ARNY BUILDS A PYRAMID - Ant Hill Gang Discovery Sheet

Name: _____

1. Draw a picture of an inclined plane.

2. What's another name for the object that you have drawn? _____

3. List the materials used in the inclined plane demonstration.

   1) _____ 2) _____

   3) _____ 4) _____

   5) _____

4. Describe the procedure used in the inclined plane demonstration.

   _____

   _____

   _____

5. How did the steepness of the ramp affect the force needed to pull the object up the ramp?

   _____

   _____

   _____

6. How do inclined planes help people?

   _____

   _____

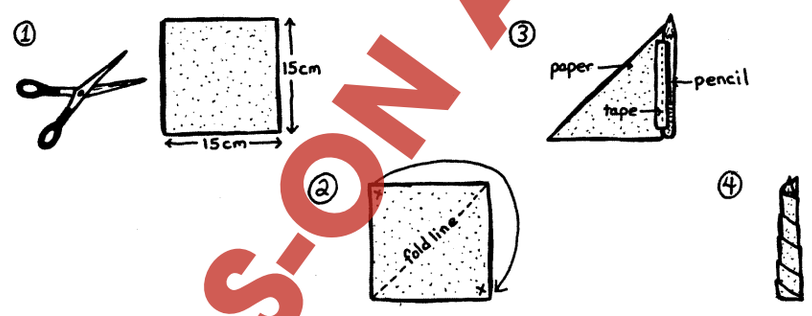
   _____

AMY'S WAY HOME - Ant Hill Gang Discovery Sheet

Name: _____

1. Problem: Arny the Ant's little sister, Amy, is in need of some help. She has to climb up a pencil to get home but the pencil is too difficult and slippery to get up. Your job is to help Amy by building a spiral staircase or screw that she can climb up. Materials needed are a pencil, paper, scissors, tape and ruler.

2. Procedure: Cut out a piece of white paper into a square 15cm by 15cm. Fold the paper in half. Draw a dark line on the paper where the fold is. Tape one side of the paper to the pencil and wind it around the pencil. The paper should form a screw that will allow Amy to climb up and make it home.



3. What other type of simple machine is the screw closely related to? _____

4. List four uses of screws.

   a) _____ b) _____

   c) _____ d) _____

5. Why are screws often used to hold wooden chairs together instead of nails?

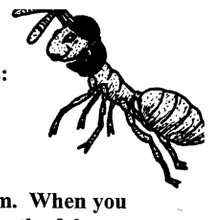
   _____

   _____

Bonus On the back of this page, draw a picture of a complicated machine that uses a screw to help make work easier.

Study the levers below. For each lever shown below label the parts as follows:

1) fulcrum - (F)
2) load - (L)
3) effort - (E)

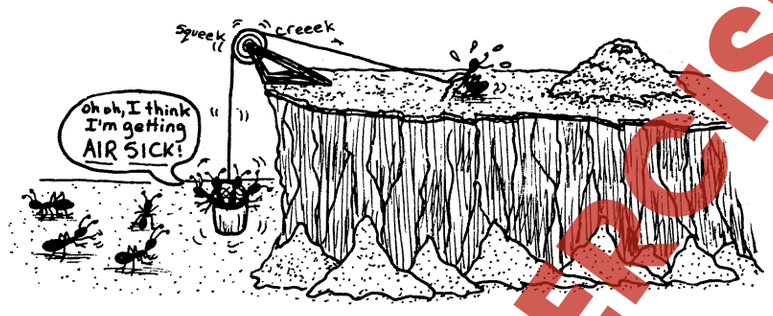


(Remember, a lever is a bar or pole resting on a turning point called a fulcrum. When you push or pry one end of the bar, you can lift something on the other end. Note: the fulcrum is not always between the load and effort!)

PULLEY POWER - Ant Hill Gang Discovery Sheet

Name: _____

1. Problem: Adam Ant has just invented the pulley. The members of the ant hill are getting tired of lifting each other up the sides of the cliff to get to the ant hill and Amy's screw is too narrow for most adult ants to get up. Adam wondered if a pulley system could help.



2. Materials:

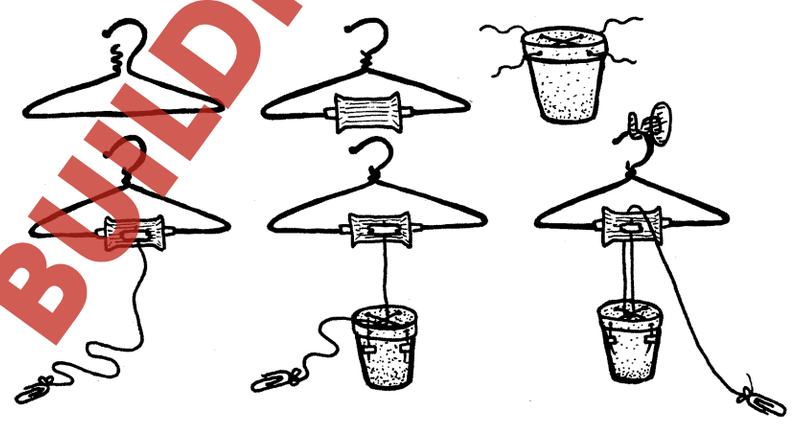
   _____

   _____

   _____

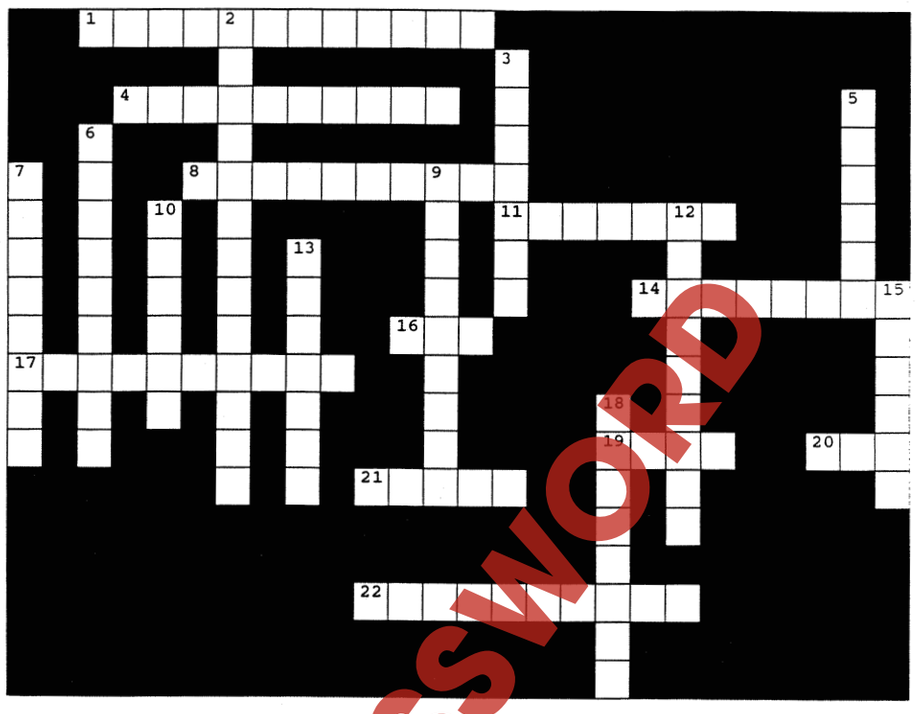
3. Procedure: Unwind a wire coat hanger. Slip an empty spool onto it. Wind the hanger back together again. Put tape around the hanger on either side of the spool to keep the spool in place. Punch two sets of holes in a paper cup. Thread string through the holes and knot on the outside of the cup. Secure the ends with tape. Take a one meter piece of string and tie a paper clip to one end of it. Thread the other end around the spool. Place the hook of the hanger on a coat hook. Hook the paper clip end of the string to the cup. Pull the loose end of the string.

4. Diagram:



CAR CRAZY

Name: _____



CLUES

Across

1. Contains gears which convert the energy of the crankshaft to the axle.
4. A device that is turned by the engine and generates electricity for the sparkplugs and the rest of the car.
8. Turns when the pistons go up and down.
11. This is the burnt gas and air that comes out of the tailpipe.
14. Burned in a car engine.
16. Added to the engine to keep all the metal parts sliding past each other easily - especially the pistons inside the cylinders.
17. Connected to the crankshaft, turns when the crankshaft turns.
19. A strong metal rod to which the tires are attached.
20. Located in front of the radiator, it blows cool air over the radiator so that the radiator can get rid of extra heat from the engine.
21. Connected to the axle, cars roll on these.
22. A device that mixes the correct amount of air and gasoline to be burned in the cylinders.

Down

2. This turns the front axle and changes the direction that the car will go.
3. Provides a jolt of electricity that will start the engine turning and get it going.
5. Made of strong metal and can slide up and down inside the cylinder.
6. This happens to the gas and air when the sparkplug makes a spark.
7. Contains the pistons.
9. Cleans the dirt and bugs out of the air before it mixes in the cylinders with the gasoline.
10. When a person pushes on a pedal, these squeeze the tires and cause them to stop.
12. Provides a tiny "lightning bolt" that ignites a mixture of gas and air inside the cylinder.
13. A device that makes noise from the engine quieter.
15. Makes a car go.
18. Contains water which flows in pipes to cool down the engine and keep it from overheating.

MACHINES REVIEW

Name: _____

1. Match each machine with its correct definition.

_____ a rope on a grooved wheel and axle	a)	inclined plane
_____ wheels with cogs that mesh together	b)	wedge
_____ two inclined planes placed together so they form a point	c)	screw
_____ a slanted flat surface connecting a lower level to a higher level	d)	lever
_____ an inclined plane wrapped around a rod or cylinder	e)	wheel and axle
_____ pipes containing fluid or air that is under pressure	f)	pulley
_____ a bar resting on a fulcrum	g)	gears
_____ a wheel attached to a rod	h)	hydraulics

2. Match each with the correct type of simple machine. (Answers may be used more than once)

_____ axe	a)	inclined plane
_____ car	b)	wedge
_____ mountain "switchback" road	c)	screw
_____ wheel barrow	d)	lever
_____ elevator	e)	wheel and axle
_____ moving-van loading ramp	f)	pulley
_____ ice auger		
_____ pencil sharpener		
_____ spiral staircase		
_____ skateboard ramp		
_____ flag pole		
_____ milk carton lifter		

LAZZZZY!

Name: _____

Instructions: Design and draw a contraption that will help a person who is lazy. Do a rough draft of your device on scrap paper. Colour your design. Describe how your contraption works by listing the steps at the bottom of the page.

NAME OF CONTRAPTION: _____

HOW THIS CONTRAPTION WORKS

1) _____ 2) _____

3) _____ 4) _____

5) _____ 6) _____

7) _____ 8) _____

9) _____ 10) _____

Magnificent Machines

What Are Machines?

A machine is a device that does work and helps to make work easier. Machines help us in three main ways.

1) Machines change energy from one form to another. For example, an electric lawnmower is a machine that changes electrical energy into mechanical energy to mow the grass.

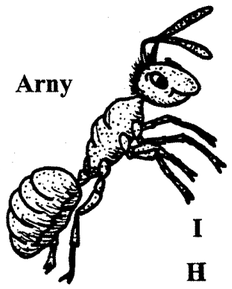
2) Some machines make work easier by changing the direction of a force. For example, pushing with a downward force on one end of a teeter totter will cause an upward force on the other end.

3) Some machines make work easier by spreading the effort needed over a longer distance.

Factfile: A force is a push or pull in a certain direction.

MACHINES WORDSEARCH

Name: _____



I	N	C	L	I	N	E	D	P	L	A	N	E	L	L
H	S	V	G	E	Z	V	R	P	U	L	L	E	Y	H
T	Y	X	E	D	V	M	U	L	R	I	X	T	M	R
W	Z	D	A	W	H	E	E	L	B	A	R	R	O	W
Z	F	O	R	Q	K	V	R	O	D	O	R	T	M	E
T	L	O	S	A	O	E	M	N	F	X	A	W	J	D
Z	E	G	R	H	U	O	A	F	Y	V	M	T	B	G
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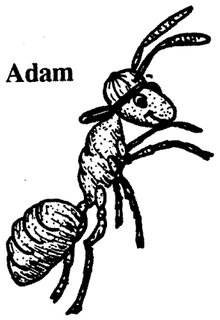
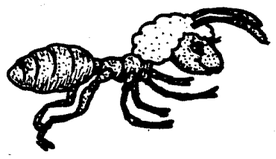
C	S	K	A	U	E	F	I	L	G	G	R	J	R	Y
T	Y	B	A	E	I	V	E	C	X	E	V	V	X	I
W	O	I	H	N	Q	S	N	R	S	C	R	E	W	P
E	I	W	K	C	I	R	Z	U	L	A	E	V	L	P
S	Q	N	O	H	W	G	I	M	T	P	J	H	C	T
F	I	P	C	R	S	W	W	N	X	T	Q	H	P	L
X	Y	P	L	H	K	U	S	F	R	O	W	P	Y	L





Find These Words:

INCLINED PLANE	LOAD	COGS
WEDGE	FORCE	HYDRAULICS
SCREW	FULCRUM	RAMP
PULLEY	EFFORT	AXE
WHEEL AND AXLE	WORK	KNIFE
LEVER	GEARS	CHISEL
AUGER	SHOVEL	WHEELBARROW
AUTOMOBILE	WINCH	ELEVATOR

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ON #1 - INTRODUCTORY LESSON

nt Objectives and Activities

Students are introduced to the topic by solving four simple riddles. They copy notes from the overhead projector and then complete a wordsearch.

sted Teaching Strategies

Begin lesson by presenting students with these four riddles. As students solve each riddle, write the four correct answers on the board.

Q1 I might be useful in the kitchen.
I can help make a cake or cookies.
I like to mix my foods.
A1 Electric Mixer

Q2 I smoke.
I drink gasoline.
I often carry children in my stomach.
My friends call me "yellow" but it is not because I am afraid.
A2 Schoolbus

Q3 I have one eye.
I move using a propeller.
I can float on top of the water.
I can go under water.
A3 Submarine

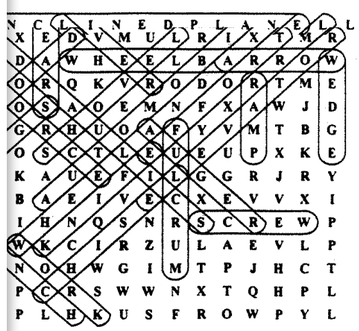
Q4 What has four wheels and flies?
A4 A garbage truck

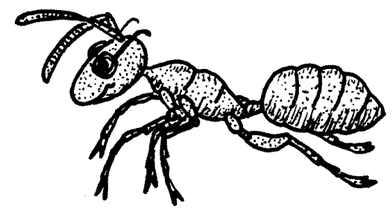
Ask students to try to figure out one final riddle, which is to guess what it is that all four [illegible]s have in common. (Of course, the answer is that they are all machines which [illegible]identally, is the topic of the unit)

Give students the first two pages of notes on "What are Machines" and "Six Simple Machines". Student notes can be photocopied onto overhead transparencies, dictated or simply written on the board for students to copy into their science notebooks. The notes provide something concrete that students can use to help complete assignments and to study from.

Once the notes have been explained and copied down, hand out the "**Machines Wordsearch**". The clues go horizontally, vertically and diagonally.

Solution





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