MOTION

UNIT OVERVIEW

Students get cool notions all about motion! This highly informative and simple-to-use unit teaches students all about motion - from linear motion, to oscillating motion, to reciprocating to rotational motion. Students participate in meaningful activities associated with the core theme of each lesson, which are followed by related overhead notes. This format helps to stress "process" rather than concentrating on the memorization of factual information. Students will "move" through this material like it was nothing!

PART I - CORE TEACHING LESSONS

1. Motion - Four Types - Motion Wordsearch

2. Linear Motion - How Fast??? - Worksheet Activity

3. Rotational Motion - Battling Tops

4. Oscillating Motion - Swinging - Experiment

5. Reciprocating Motion - Piston Power Worksheet

6. Levers And Linkages - Picture Enlarger

7. Rotary To Linear Motion - Windmill

8. Crankshafts And Cams - Motion Pictograms

9. Energy Transfers - Action Cartoon

10. Culminating Activity - Motion Theme Park

PART II - OPTIONAL LESSONS

1. Motion Crossword

2. Matching Review

3. Oscillating Motion Bowling

4. Bowling

5. Science Videos

6. Hot Rod Report

7. Elastic-Powered Mania

8. Internet Fill-In-The Blanks

9. Levers and Linkages Review

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PART III - STUDENT NOTES

Basic information and concepts are conveyed using student notes. These notes can be put onto overhead transparencies, photocopied for the students or simply written on the board for students to copy into their notebooks.

HOW FAST???

NAME:_

Instructions: Answer the word problems below. Be sure to write down the formula and show all of your work. Put your final answer in the box provided.

The team bus carrying a junior hockey team went on a road trip. The bus travelled 186 kilometers in 2 hours. What was the speed of the bus?



A 777 passenger jet, carrying 387 peoples is able to travel 2585 km in 5 hours. What is the speed of the jet?



In 3 hours, the fastest spy plane in the world, called the SR 71 Blackbird, is able to fly a distance of 5496 km. What is the speed of this jet?



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SWINGING

NAME: _

What is the purpose of the experiment? (What are you trying to find out?)

Part I

- Cut two lengths of string 30 cm long. Attach a large mass to one string and a smaller mass to the other.
- Hold the pendulum against a wall and pull it back so it is horizontal. Release it so that it can swing back and forth. Count how many times the pendulum swings back and fourth in one minute. Repeat with the smaller pendulum and record your counts in the boxes provided.



Number Of Swings (larger mass)

Number Of Swings (smaller mass)

What did you learn in Part I of this experiment?

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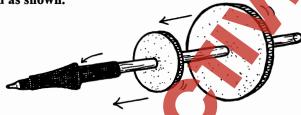
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BATTLING TOPS

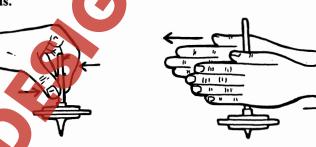
NAME:

Instructions:

- Your task is to make a working top that will spin for as long as possible, using only the ink cartridge from a "Papermate" pen, cardboard, scissors, glue, tape, markers, and pencil crayons.
- Cut out cardboard pieces and poke a hole in the center of each. Slide them onto the pen as shown.



- At least two cardboard pieces must be used to make each top (although more can be used if you choose). The pieces can be glued or taped together and attached to the pen.
- Experiment to determine what size, shape and number of cardboard pieces will allow your top to spin the longest. Also, find out the best way to start your top spinning, whether it is by using your thumb and forefinger or using two hands.



- After your top is built, decorate it using markers or pencil crayons.
- Time limit is 20 minutes.

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	Why is a gasoline engine a good example of reciprocating motion?
	What is the purpose of a spark plug in a cylinder?
	What is the purpose of the piston rod in an engine?
	Why are cylinders and pistons made out of very strong metals?
	Why is it important for both valves to be closed when the spark plug sparks
	Describe one difficulty or problem that designers would have when trying to join six or eight cylinders together instead of just one.
	oil six of eight cynnucis together instead of just one.

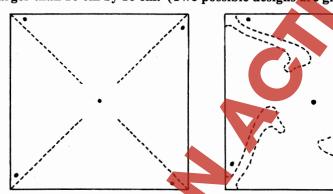
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WINDMILL

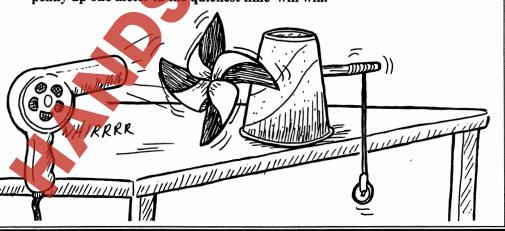
NAME:

Instructions:

- 1) Your challenge is to design and construct a windmill that will lift a penny one meter, using the "wind" produced by a hair dryer.
- 2) The turbine for the windmill must be cut from a piece of paper that is no larger than 10 cm by 10 cm. (Two possible designs are given below.)



- Each group is allowed to use only the following materials: paper cup, pencil, 10 cm of tape, glue if needed, penny, string, and paper.
- 4) Each group will be given 30 minutes to make the device. At this time, the hair dryer will be used to test the machines. The machine that lifts the penny up one meter in the quickest time will win.



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MOTION NAME: **CLUES Down** Often used to help reduce friction. (Also **Across** used to make a door stop squeaking.) Do you love science? Distance divided by time gives you this. 7. Rotational motion moves in one of (Another word for velocity.) A system of levers working together. 8. Often used to open and close valves or To increase mechanical advantage, 5. in food processing. move the load closer to this. Motion in a straight line A very simple way to turn rotational 10. Energy of move input into linear output. These can be found inside grandfather Does your teacher give too much clocks in oscillating motion. homework? When the piston and piston rod move This friction reducer is often used in up and down, this will turn in an non-stick cooking ware. engine. (Also, another word for a This moves up and down in a grump.) reciprocating engine. Used in wheels to help reduce friction. Wheel and _

ACTION CARTOON
NAME:
Instructions: Your job is to make up an action cartoon. Your cartoon must have as much action in it as possible and should have at least ten changes in energy in the story. Be Creative! After the story is complete, choose three "scenes" from the story to illustrate in the spaces provided.
Title:

4) Crank (Crankshaft)

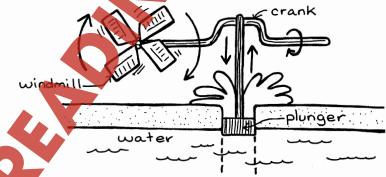
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One of the most common ways of translating motion is to use a crank or crankshaft. The up and down motion of a reciprocating engine is connected to a shaft that has a bend in it. As the piston moves up, it pulls on the crankshaft and causes it to rotate a half-turn. When the piston moves down, it forces the crankshaft down and completes the rotation of the crankshaft. Reciprocating motion is translated into rotational motion.

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Crankshafts also work in the reverse way to translate rotational motion to up and down or reciprocating motion. The windmill spins, turning the crank. The crank is attached to a slider or piston which moves up and down as the crankshaft continues to rotate. Windmills such as this are often used to pump water from one place to another. When the plunger is down, water is sucked into the chamber. As the crankshaft rotates, the plunger moves and water is forced out of the hole at the top.



Factfile: A crank is a person who is grumpy and who has probably not received the proper amount of sleep.

MOTION WORDSEARCH



NAME:

E G A T N A V D A L A C I N A H C E M N REMOSCILLATING MOTION E R F X E N L V I Z C T Y A V S U I C X X A O H V M T T M G O Y O O F B T B T L ZCTTFAHSKNARCDHORGFG C K E Q A B Q W O M M V T L M M H W J H HAEOQTMJYFCOPGEKDXDN C N M Q R U I U E H A D N V G G F Q K M YDNFSNNOITCIRFHAYWKF T P Q P O R K I N E T I C E N E R G Y B I I E T X L I N K A G E S H Q B R I Y E S N S N A Z L X C X L A N E M C G T T S CIZEDMNOITOMRAENILZJ POVXSURWWIDZOPUCNSMN ANMQUPLEVERLLTOXPFUR T H W I I D E U M N R H Q L I F L A Y M ZZECXGFIDPXVXIDPNBJ G R P H F P S G T O T V T I R Q A E C T L J P J M

Find These Words:

CAM
CAM FOLLOWER
CRANKSHAFT
CYCLE
FRICTION
HERTZ

KINETIC ENERGY
LINEAR MOTION
MECHANICAL ADVANTAGE
OSCILLATING MOTION
ROTATIONAL MOTION
RACK AND PINION
RECIPROCATING MOTION

LEVER
LINKAGES
PENDULUM
PISTON
SPEED
VELOCITY

N #1 - MOTION - FOUR TYPES

Objectives and Activities

tudents understand what motion is and learn the four types of motion (linear, rotational, scillating, reciprocating).

tudents complete notes on the topic and an introductory wordsearch.

ed Teaching Strategies

atroduce the unit by challenging students to guess the answers to the following questions:

- I am the fastest runner in the animal world.
 - a) greyhound b) roadrunner c) gazelle d) cheetah
- d) cheetah 100 km/hour
- The fastest human in the world can run 100 meters in less than:
 - a) 9 seconds b) 10 seconds c) 12 seconds d) 20 seconds.
- b) 10 seconds Maurice Greene 9.79 seconds
- The fastest breed of dog is.
 - a) Poodle b) Doberman c) St Bernard d) Greyhound
- d) Greyhound
- What do the three previous questions have in common?
- The questions all have something to do with motion.

ce with the notes about the four types of motion. Students can write the notes in notebooks, with the teacher giving the notes on overheads or written on the board.

s a fun, introductory activity designed to familiarize students with some of the vocabulary ords in the unit, complete "Motion Wordsearch".

Answer Key

