

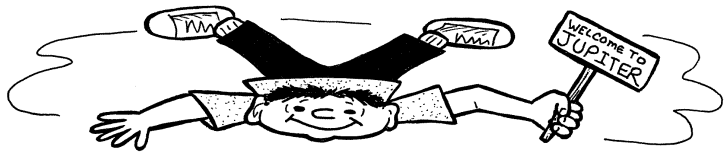
GRAVITY FORCE AND AIR PRESSURE

NAME: _____

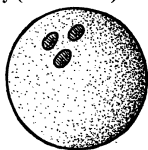
Instructions: Complete the following problems being sure to show your work. (Answer in Full Sentences where possible - A.I.F.S.)

- List four types of forces.
 - _____
 - _____
 - _____
 - _____

- Why is the force of gravity on Jupiter much higher than on earth? (A.I.F.S.)



- What is the force of gravity (in Newtons) of a bowling ball that has a mass of 3kg?



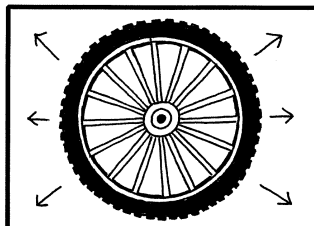
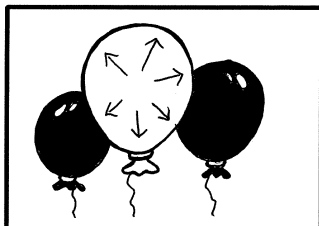
- What is the gravity force on a student with a mass of 45kg?



Air Pressure
Air is a gas that pushes down on a surface and would feel pressure.

I... CAN'T... TAKE...

The air inside a balloon pushing outwards or a bike tire that has been pumped up are both examples of air pressure.

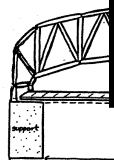
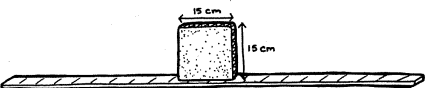


Factfile: Air under high pressure is commonly used to operate all kinds of tools. Mechanics in garages use compressed air drills and wrenches, roofers use air-operated nail guns, while city workers use jack-hammers powered by air under pressure.



*** Note ***

Due to time restrictions, teachers may choose to do the bridge building activity as a section, apart from the first eight lessons. It makes a dandy, week-long project to get into. Because students become so self-motivated, this project is especially suitable.

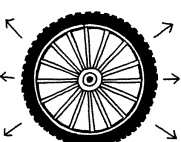


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FORCES ON STRUCTURES AND MECHANISMS

NAME: _____

- | | |
|---|------------------------|
| a) a push or a pull | _____ Pulley |
| _____ axle with teeth or cogs | _____ Force |
| _____ floating bridge | _____ Fulcrum |
| _____ force pulls on an object | _____ Arch |
| _____ lever | _____ Gear |
| _____ class lever | _____ Gravity |
| _____ class lever | _____ Heat |
| _____ most important with this type of bridge | _____ Newtons |
| _____ rope and a rope | _____ Machine |
| _____ object is squeezed | _____ Crowbar |
| _____ can be used in Roman architecture | _____ Suspension |
| _____ used for support | _____ Concrete |
| _____ downward force created by mass | _____ Wheelbarrow |
| _____ pushed by air | _____ Tension |
| _____ measured in these units | _____ Compression |
| _____ forces often cause this | _____ Truss |
| _____ steel, water and cement | _____ Tweezers |
| _____ makes it easier | _____ Block And Tackle |
| _____ a moveable pulley used together | _____ Air Pressure |
| _____ in a lever | _____ Pontoon |



58

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HOMEWORK FOR TEACHER - GUIDELINES

NAME: _____

Instructions:

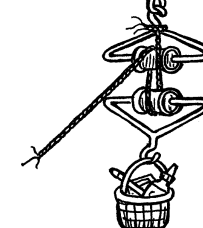
- Your job is to devise an experiment for your teacher that will help the teacher understand the three types of pulley set-ups shown below. Your experiment should have a way of helping the teacher learn which pulley set-up moves the load with the least (and most) amount of effort.



Single Fixed Pulley



Moveable Pulley



Block And Tackle

- Your experiment should ask the teacher to explain what the purpose of the experiment is.
- Your experiment should have instructions on how to set up the apparatus and how it should be used. (A diagram might be useful.)
- Your experiment should describe some way of testing which setup requires the most and least effort. (A scale to weigh fish might come in handy.)

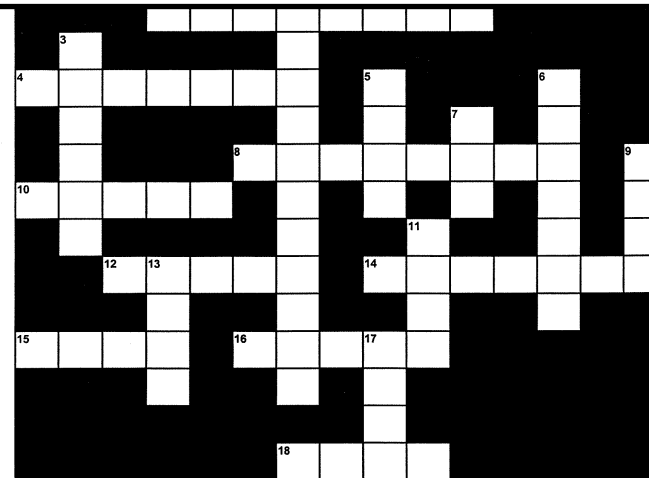


- Your experiment should ask the teacher questions about the experiment and what was learned. (Don't make the questions too easy or too difficult.)
- Your experiment should fit onto a one page worksheet.

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21

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CLUES

Across

- A mixture of sand, gravel, water and cement. (Gangsters make galoshes for people out of this building material)
- Move this close to the load to make the work easier.
- Always works to slow something down.
- A simple machine - with three types.
- Used as a support in bridges and buildings.
- Temporary bridges made by the army are often this type.
- Most simple type of bridge.
- Or a pull.

Down

- When a force squeezes an object - the opposite of tension.
- A simple machine used to hoist objects.
- Ronald McDonald uses this design in his advertising - the Romans used it too.
- When an object is being pulled.
- _____ pressure. Used to operate nail guns, wrenches and jackhammers.
- Gravity force here is only one sixth as strong as on the Earth.
- Used to carry tension forces.
- Another word for inclined plane - a type of simple machine.



PICTOGRAMS - FORCES AND STRUCTURES

NAME: _____

Instructions: Solve these difficult brain teasers using the clues provided:

-
-
-
-
-

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60

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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.

- 1) 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?



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



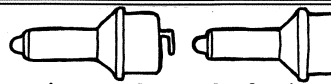
- 3) In 3 hours, the fastest spy plane in the world, called the SR 71 Blackbird, is able to fly a distance of 5496 km. What is the speed of this jet?



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7

Questions



- 1) Why is a gasoline engine a good example of reciprocating motion?

- 2) What is the purpose of a spark plug in a cylinder?

- 3) What is the purpose of the piston rod in an engine?

- 4) Why are cylinders and pistons made out of very strong materials?

- 5) Why is it important for both valves to be closed when the piston is at the top of the cylinder?

- 6) Describe one difficulty or problem that designers would face if they tried to join six or eight cylinders together instead of just one.

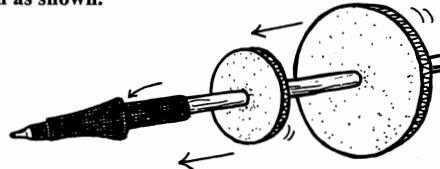
BATTLING TOPS

NAME: _____

Instructions:

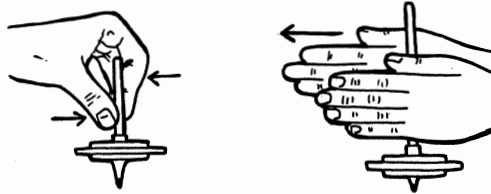
- 1) Your task is to make a working top that will spin for as long as possible using only the ink cartridge from a "Papermate" pen, cardboard, glue, tape, markers, and pencil crayons.

- 2) Cut out cardboard pieces and poke a hole in the center of each and slide it onto the pen as shown.



- 3) At least two cardboard pieces must be used to make each top (one can be used if you choose). The pieces can be glued or taped to the pen.

- 4) 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 spin your top, whether it is by using your thumb and forefinger or two hands.



- 6) After your top is built, decorate it using markers or pencil crayons.

- 7) Time limit is 20 minutes.

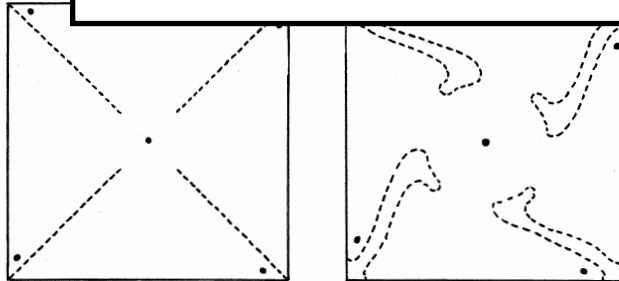
Instructions:

- 1) Your challenge is to lift the penny one meter in the shortest time possible.

- 2) The turbine must be larger than the turbine in the picture.

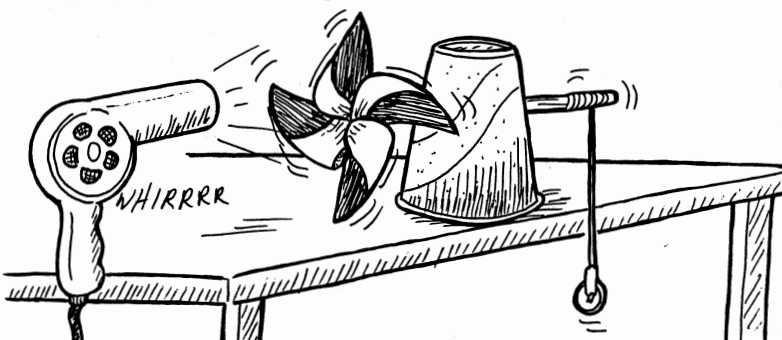
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11



- 3) Each group is allowed to use only the following materials: paper cup, pencil, 10 cm of tape, glue if needed, penny, string, and paper.

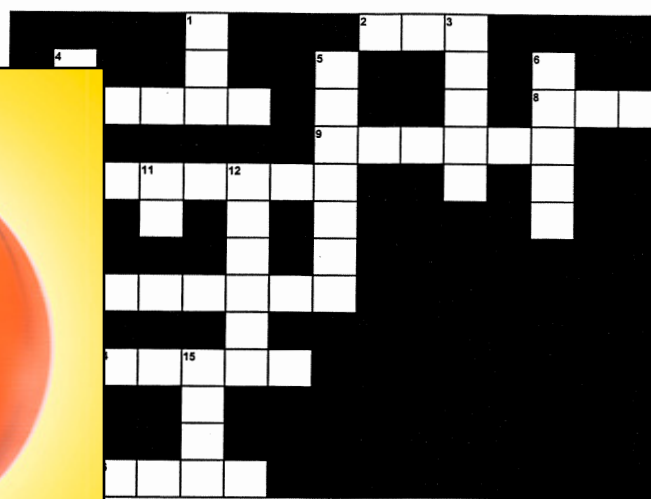
- 4) Each group will be given 30 minutes to make the device. At this time, the hair dryer will be used to test the machines. The machine that lifts the penny up one meter in the quickest time will win.



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MOTION

NAME: _____



Down

- Often used to help reduce friction in a machine.
- Distance divided by time gives you this.
- (Another word for velocity.)
- A system of levers working together to move a load.
- To increase mechanical advantage, you should move the load closer to this.
- A very simple way to turn rotational motion into linear motion.
- Does your teacher give too much homework?
- This friction reducer is often used in non-stick cooking ware.
- This moves up and down in a reciprocating engine.
- Wheel and _____.

37

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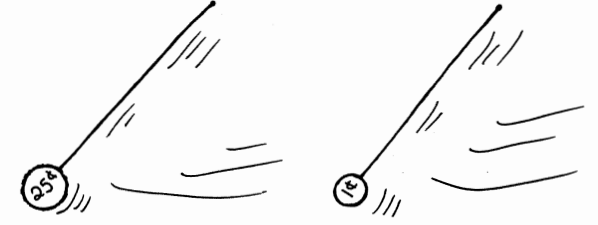
SWINGING

NAME: _____

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

Part I

- 1) Cut two lengths of string 30 cm long. Attach a large mass to one string and a smaller mass to the other.
- 2) 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 forth 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)

- 3) What did you learn in Part I of this experiment?

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13

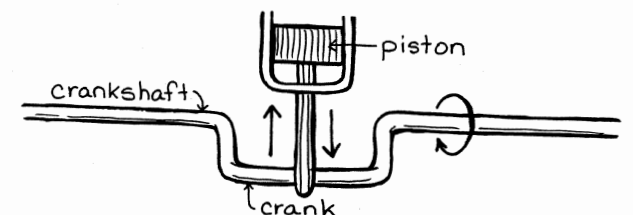
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Instructions: Your job is to make up an action cartoon. Your cartoon must have as much action in it as possible and should have at least ten changes in energy in the story. Be Creative! After the story is complete, choose three "scenes" from the story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

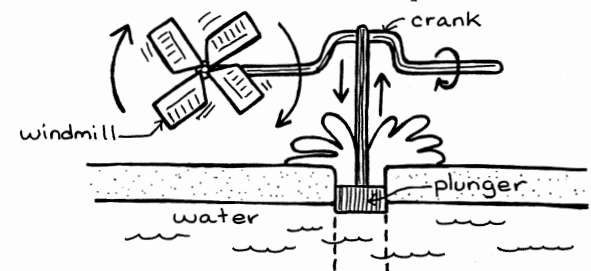
Title: _____

- 4) **Crank (Crankshaft)**

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.



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.

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54

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Motion

