

Names:

School:

2002 UTAH SCIENCE OLYMPIAD - PHYSICS LAB

SIMPLE MACHINES 1 - PART 1

There are two parts to the **SIMPLE MACHINES 1** competition. **Both parts must be completed within a time of 12 minutes.**

Masses: swinging bar = 448 g  
clamp with 2 screws = 50 g  
clamp with 1 screw = 47 g

Note that the mass of the hanging weight holder is 50 g. You may neglect the mass of the string.

-----  
**You do not have to complete PART 1 in order to do PART 2.**

**PART 1:** Calculate the total mass (including the mass of the weight holder) that will pull the swinging bar to a horizontal position. The swinging bar should be next to (but not rubbing against) the pulley clamp. You may slide the swinging bar slightly away from the pulley clamp, but do not change the position of any other part of the setup.

If you wish, you may pull on the weight holder to bring the bar to a horizontal position. **In Part 1 you may not hang anything from the weight holder or remove the weight holder from the string.**

Clearly explain in words how you did your calculations. **You calculation must include a clear and careful drawing that identifies where measurements were made on the experimental set-up. Failure to include a drawing will result in ZERO POINTS for PART 1.** Show your drawing and calculations on the next page. You may use additional sheets of paper for your calculation if you wish - be sure your names are every sheet.

Put your value of the total mass (including units) here: \_\_\_\_\_

When you are finished with Part 1,  
turn it in to the event supervisor  
and you will be given Part 2.

Names:

School:

2002 UTAH SCIENCE OLYMPIAD - PHYSICS LAB

SIMPLE MACHINES 1 - PART 2

There are two parts to the **SIMPLE MACHINES 1** competition. **Both parts must be completed within a time of 12 minutes.**

Masses:    swinging bar = 448 g  
             clamp with 2 screws = 50 g  
             clamp with 1 screw = 47 g

Note that the mass of the hanging weight holder is 50 g. You may neglect the mass of the string.

-----

Use the weights provided to measure the total mass (including the mass of the weight holder) that will pull the swinging bar to a horizontal position.

**Put your value of the total mass (including units) here:** \_\_\_\_\_

Names:

School:

2002 UTAH SCIENCE OLYMPIAD - PHYSICS LAB

SIMPLE MACHINES 2

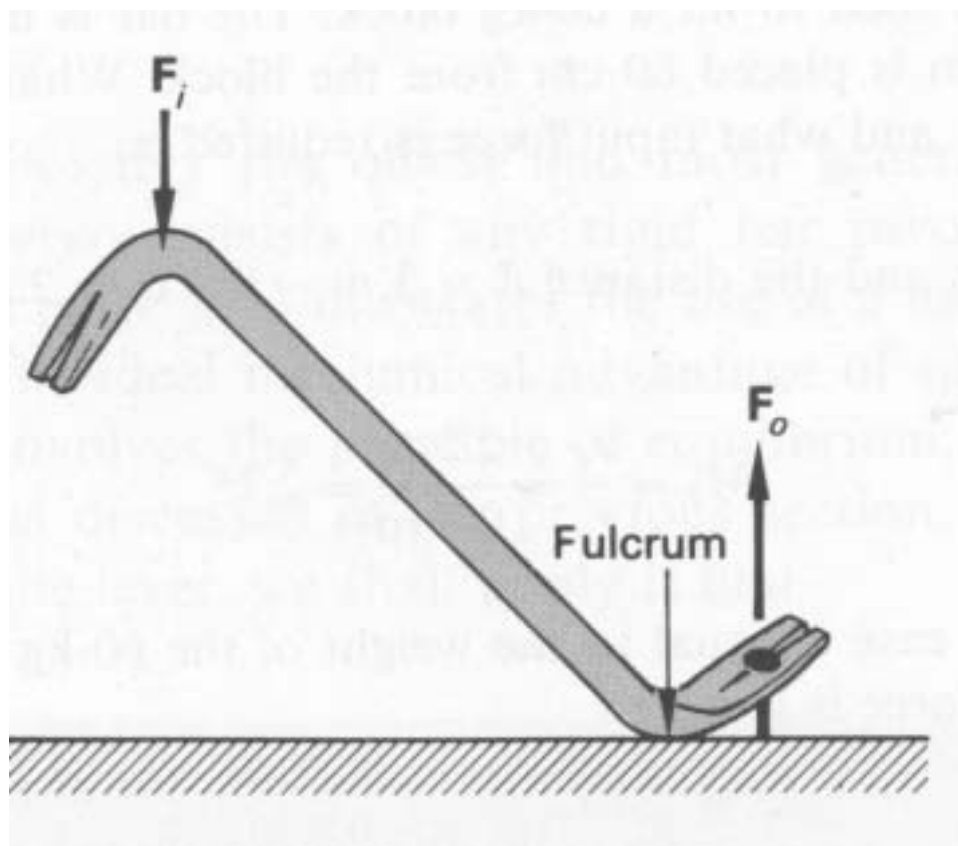
There is one part to the SIMPLE MACHINES 2 competition. It must be completed within a time of 12 minutes.

YOUR SCORE ON SIMPLE MACHINES 2 WILL ALSO SERVE AS THE TIEBREAKER FOR THE PHYSICS LAB COMPETITION

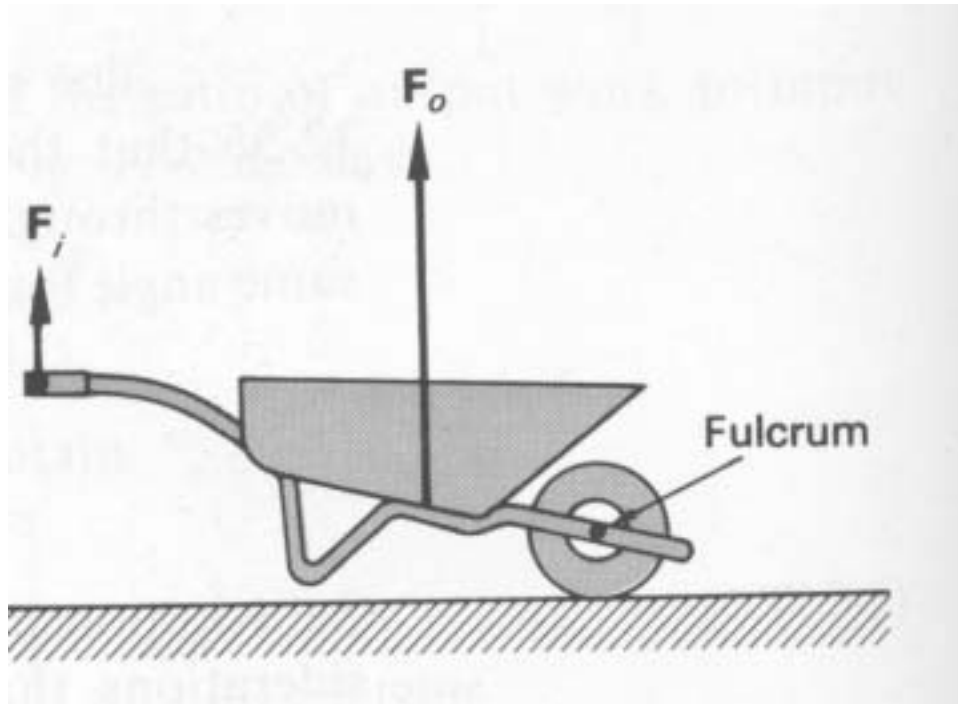
-----  
Make measurements on the following TEN diagrams and determine the ideal mechanical advantage for each the machines shown. (The input and output forces are sometimes shown for clarity.) **PUT A BOX AROUND YOUR VALUE OF THE IDEAL MECHANICAL ADVANTAGE FOR EACH MACHINE.**

You must indicate on the diagrams where each measurement was made and the value of each measurement. Failure to do this will result in a score of zero for that machine.

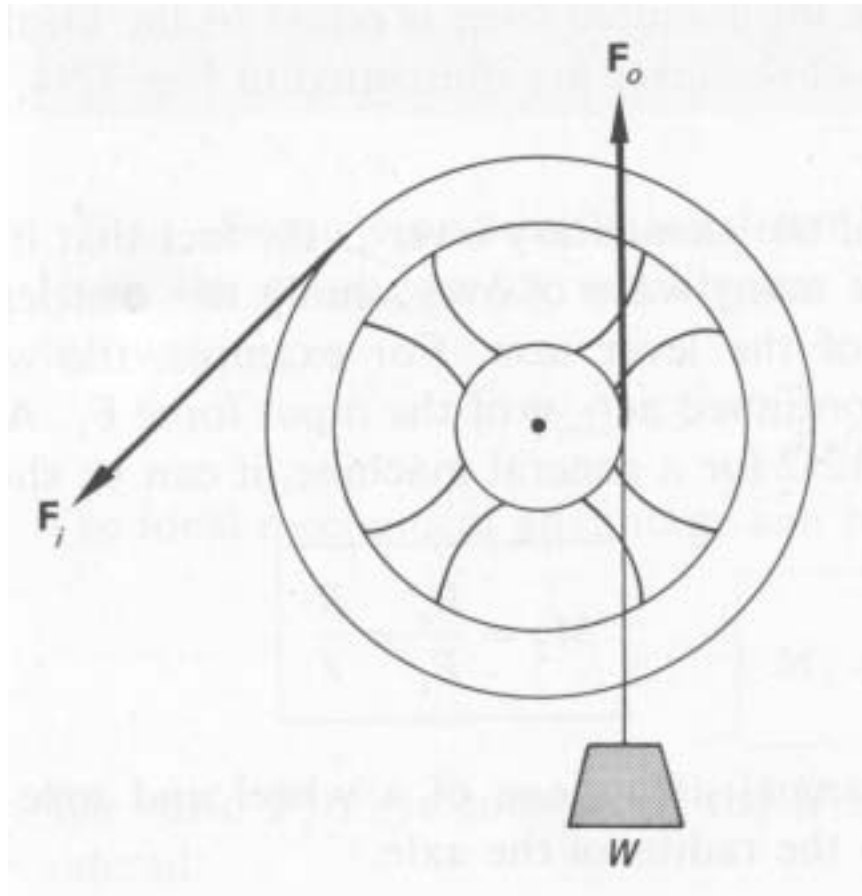
1.



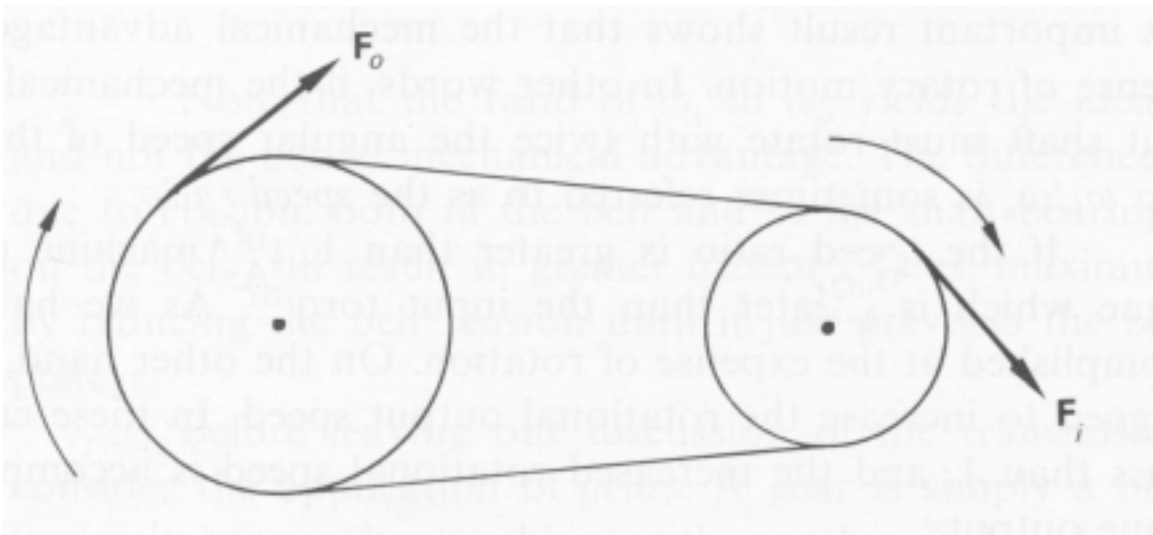
2.



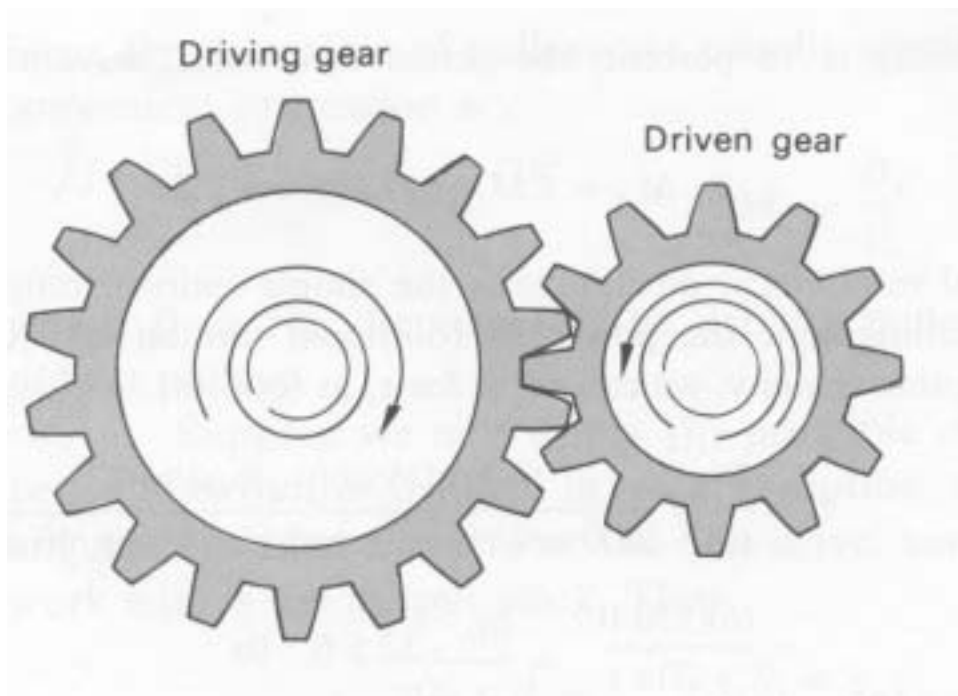
3.



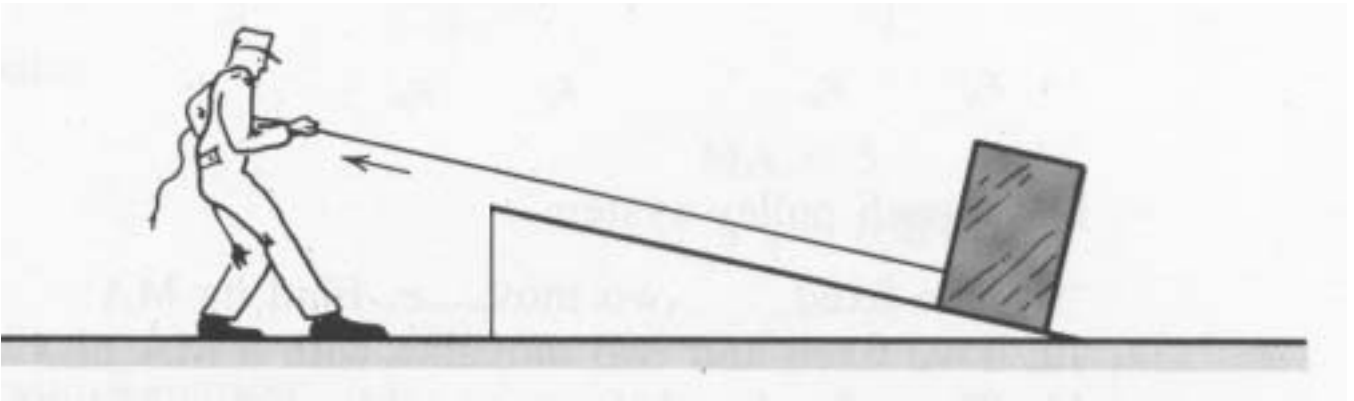
4.



5.



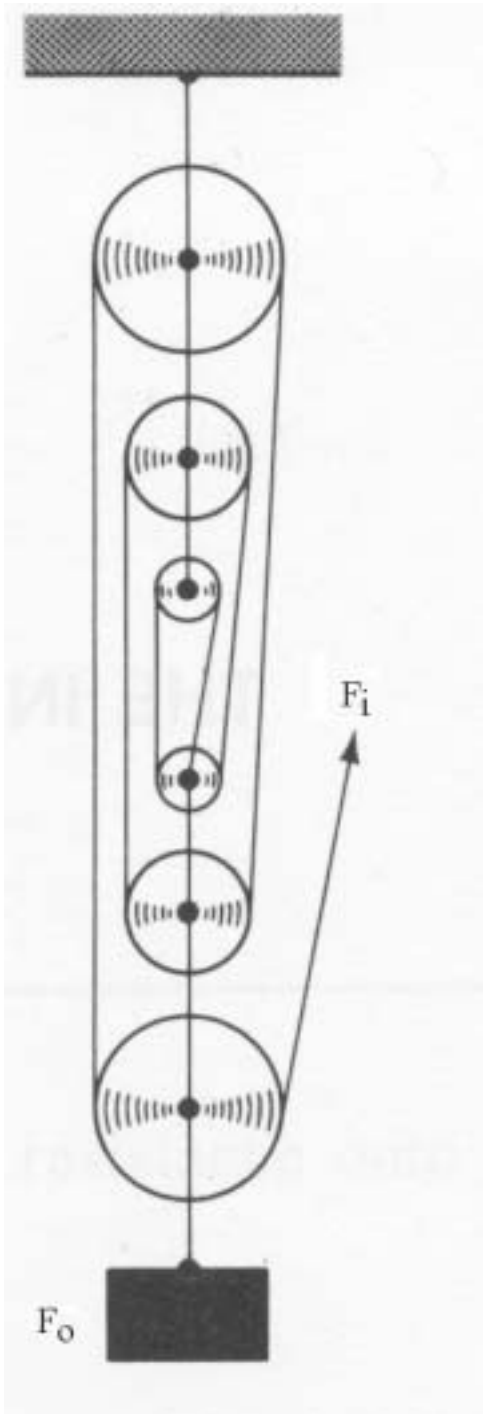
6.



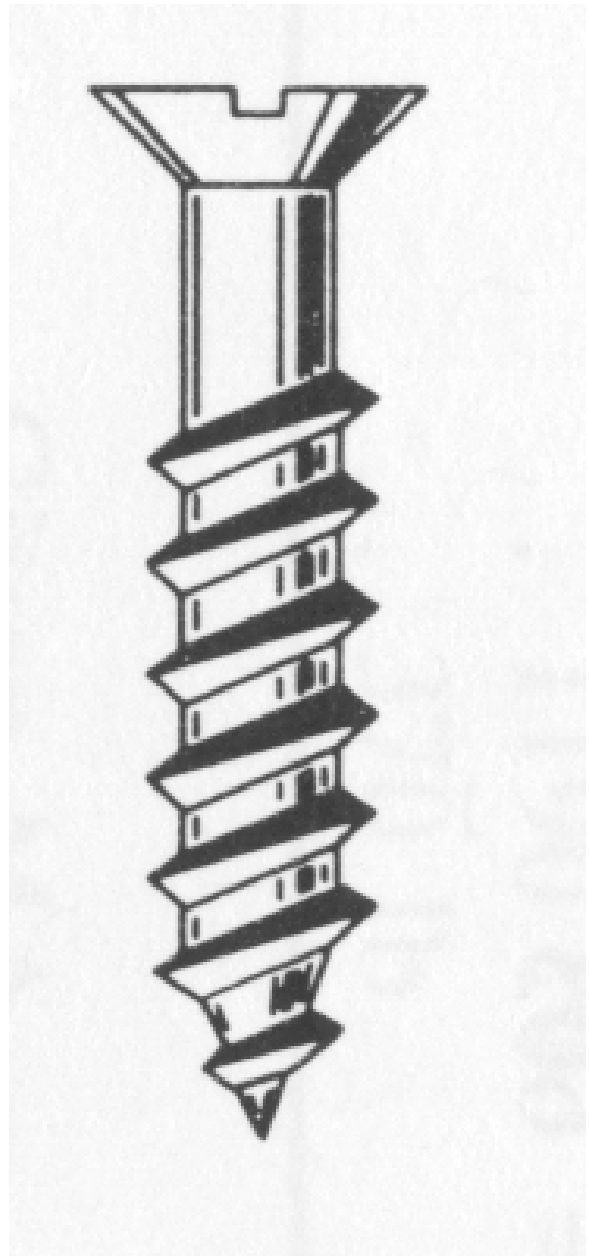
7.



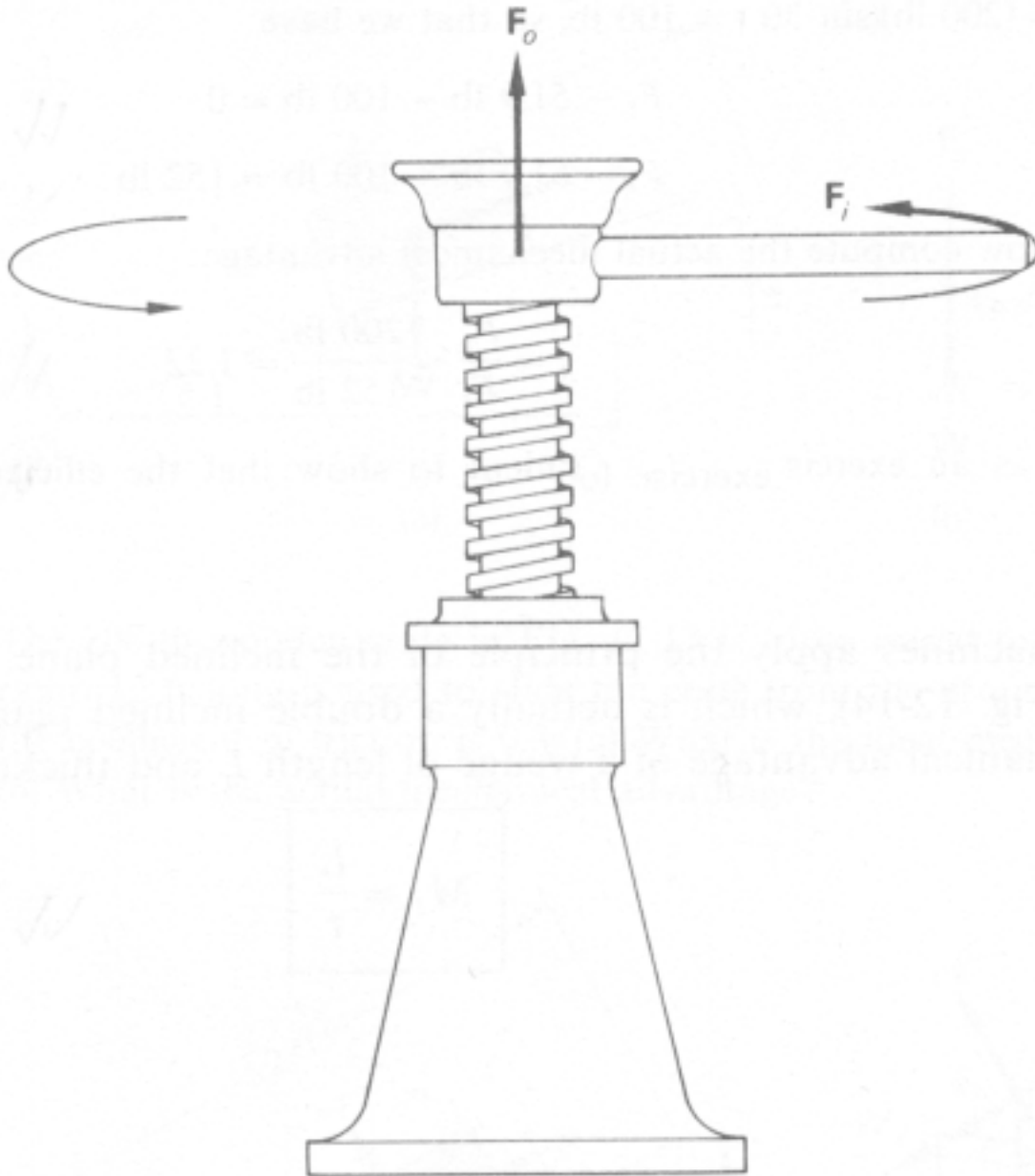
8.



9.



10.





Names:

School:

2002 UTAH SCIENCE OLYMPIAD - PHYSICS LAB

SIMPLE MACHINES 3

There are three parts to the SIMPLE MACHINES 3 competition. **All parts must be completed within a time of 12 minutes.**

-----  
The six basic simple machines are: the lever, inclined plane, pulley, wheel and axle, wedge, and screw.

Stations 3A, 3B, and 3C (identified on the chalkboards) each have a different device that incorporates at least two simple machines.

**You will change stations every four minutes.** At each station, you will (1) make a sketch of the device and (2) identify on your sketch all of the simple machines (as listed above) that are used in the device. No calculations are involved! Make your sketches on the following pages; sketch each station's device on a different page.

Remove the towel covering your device and begin! (Cover your device when done.)

2002 UTAH SCIENCE OLYMPIAD - PHYSICS LAB

SIMPLE MACHINES 3 - PAGE 2

---

STATION 3A

2002 UTAH SCIENCE OLYMPIAD - PHYSICS LAB

SIMPLE MACHINES 3 - PAGE 3

---

STATION 3B

2002 UTAH SCIENCE OLYMPIAD - PHYSICS LAB

SIMPLE MACHINES 3 - PAGE 4

---

STATION 3C