

Summary

This week the instrument in question was a pulley system — a simple machine. Simple machines are mechanisms to increase force but decrease work. The work going into the machine was the force going into it times some input distance. The work coming out of the machine is the force coming out of it times some output distance. Finally, the efficiency percentage is a ratio of the output work divided by the input work.

Data Sheet

F_{in}	W_{in}	F_{out}	W_{out}	AMA	% Efficiency
gwt	gwt · cm	gwt	gwt · cm		%
20.5	1230.0	50	500	2.439	40.65
59.7	3582.0	250	2500	4.1876	69.79
94.5	5670.0	450	4500	4.7619	79.37
132.1	7926	650	6500	4.9205	82.01
152.2	9132	850	8500	5.5848	93.08

Calculations

```
>>> s_in = 60
>>> 20.5 * s_in
1230.0
>>> 59.7 * s_in
3582.0
>>> 94.5 * s_in
5670.0
>>> 132.1 * s_in
7926.0
>>> 152.2 * s_in
9132.0
>>> s_out = 10
>>> 50 / 20.5
2.4390243902439024
>>> 250 / 59.7
4.187604690117253
>>> 450 / 94.5
4.761904761904762
>>> 650 / 132.1
4.920514761544285
>>> 850 / 152.2
```

```
5.584756898817346
>>> 100 * 500 * 1230
61500000
>>> 100 * 500 / 1230
40.65040650406504
>>> 100 * 2500 / 3582
69.79341150195421
>>> 100 * 4500 / 5670
79.36507936507937
>>> 100 * 6500 / 7926
82.0085793590714
>>> 100 * 8500 / 9132
93.07928164695576
>>>
```

Question

The efficiency of a simple machine is always less than 100% because machines always lose a little bit of work to things like friction or dispelling of excess heat. These inefficiencies are important to understand in engineering. Some examples of simple machines are a lever such as a crowbar trying to pry something off of something else, a hydraulic system, or a donkey pulling a cart on wheels.