T12

1. Support rope B	A. How most simple machines lose energy.
2. Friction A	B. The number of ropes pulling up between the pulleys of the pulley system.
3. Fulcrum D	C. The "wheels" that allow the rope in a pulley system to move.
4. Bending E	D. The point a lever pivots on.
5. Pulley C	E. How a lever loses Mechanical Advantage.

How do pulleys lose energy? thru friction

How do incline planes lose energy? thru friction

How do levers lose energy? thru friction

Input Force (F_{in}) or Output Force (F_{out})?

I How much force you push up a ramp.

O How heavy the object is.

I How hard you pull on the rope coming out of the pulley system.

O How much force the lever pushes up on the object.

O The resistance of gravity pulling on the object.

I You pulling down on the lever.

Distance of Effort (D_E) or Distance of Resistance (D_R)?

Dr How far the pulley lifts the object.

De How far you apply your force from the fulcrum.

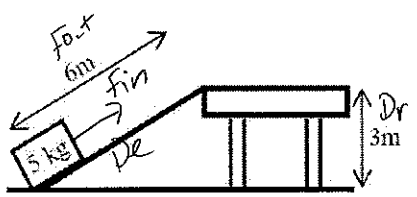
Dr How high you lift the object.

De The length of the incline plane.

De How far you push down on the lever.

Dr The distance from the fulcrum to the object.

Label D_E, D_R, F_{in}, F_{out} and the type of simple machine for each of the following.



Calculate F_{out}. $F_W = 5kg \cdot 10m/s^2 = 50N$

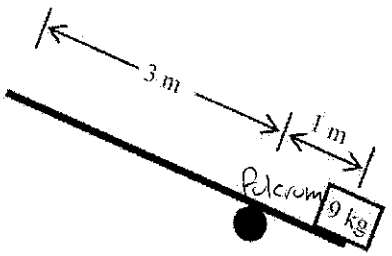
Estimate F_{in}. $\frac{Dr}{De} = \frac{3m}{6m} = \frac{1}{2} \cdot F_{out} = 25N$

Which is greater: F_{in} or F_{out}? Fout

Which is greater: D_E or D_R? De

Which takes more energy, pulling it up the ramp or lifting it straight up?

Due to frictional losses



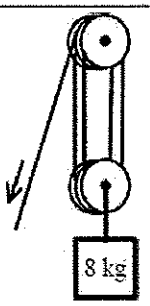
Calculate F_{out}. $F_W = 90N$

Label the fulcrum.

Which is bigger: how far you push down or how far the object lifts up?

Estimate F_{in}. $\frac{Dr}{De} = \frac{1m}{3m} = \frac{1}{3}rd$

$\frac{1}{3} \cdot 90N = 30N$



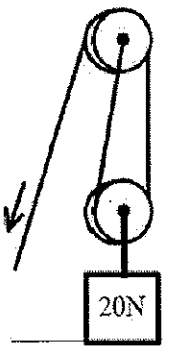
Calculate F_{out}. $F_W = 80N$

How many support ropes? 4

How much force will you need to lift it? $\frac{F_{out}}{\#\text{Supp. Ropes}}$ $\frac{80N}{4\text{ropes}} = 20N$

If the object lifts 2 m, how much rope do you pull out?

$2m \times 4 = 8m$



How many support ropes? 2

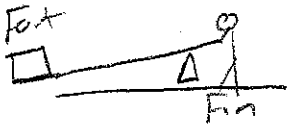
How much rope do you pull out to lift the object? 1m

What is the MA of this pulley system? 2 # of Ropes

What is F_{in}? $\frac{F_{out}}{\#\text{Ropes}} = \frac{20N}{2} = 10N$

Draw two levers.

Lever 1: hard to lift.



Lever 2: easy to lift.