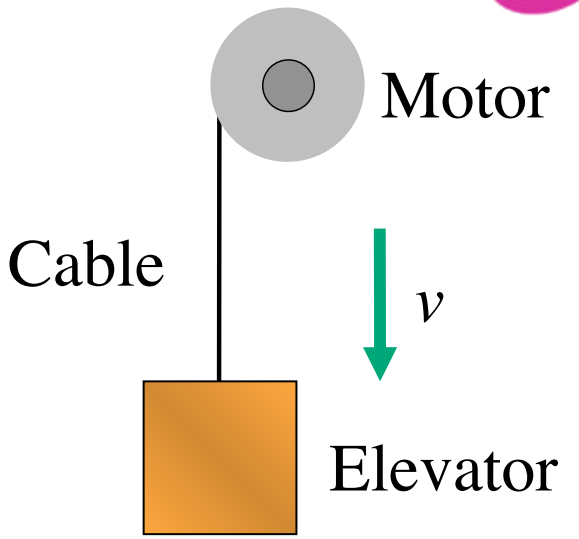
Q6.2

An elevator is being *lowered* at a constant speed by a steel cable attached to an electric motor. Which statement is correct?



A. The cable does positive work on the elevator, and the elevator does positive work on the cable.

B. The cable does positive work on the elevator, and the elevator does negative work on the cable.

C. The cable does negative work on the elevator, and the elevator does positive work on the cable.

D. The cable does negative work on the elevator, and the elevator does negative work on the cable.

Text 'PHYS1JC' and your answer to 22333

Exam #1

- Thursday, March 3. 5-7pm. CR 306
- Chapters 1-5
- Closed book. Calculators are allowed.
- 1 page of notes allowed (single-sided)

Ch 6.2-3
Kinetic Energy

PHYS 1210 - Prof. Jang-Condell

Goals for Chapter 6

- To understand and calculate the work done by a force
- To understand the meaning of kinetic energy
- To learn how work changes the kinetic energy of a body and how to use this principle
- To relate work and kinetic energy when the forces are not constant or the body follows a curved path
- To solve problems involving power

Kinetic Energy

$$K = \frac{1}{2}mv^2$$

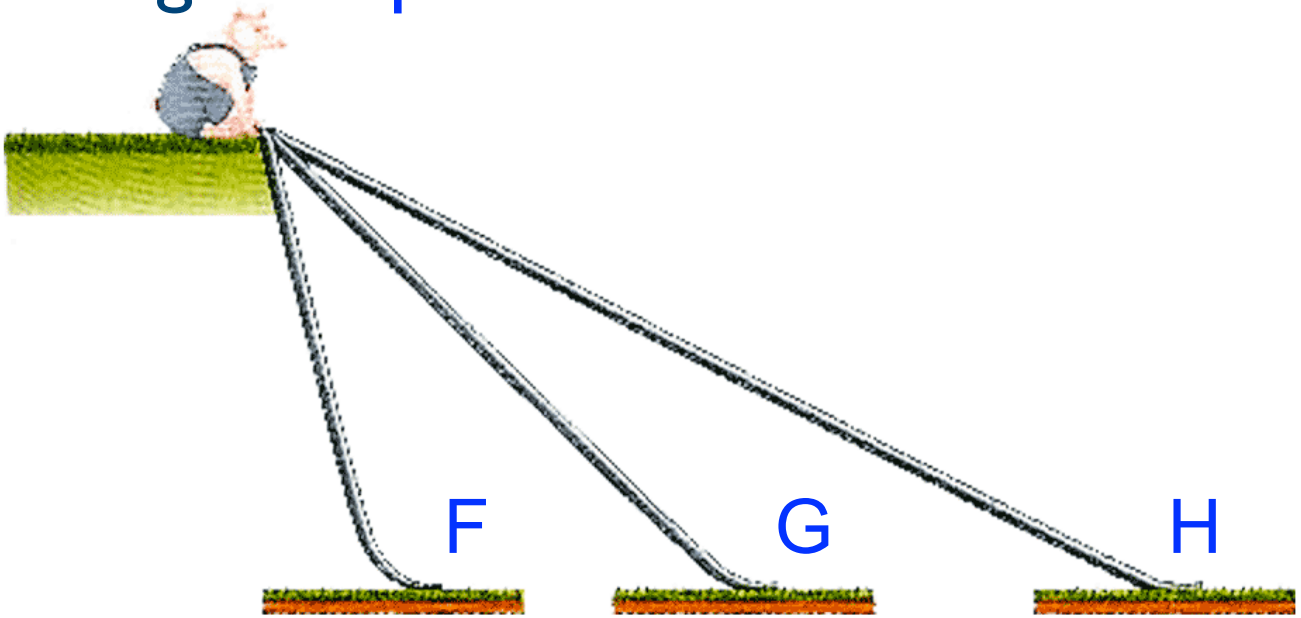
The Work-Energy Theorem

- The work done by the net force on an object equals the change in the object's kinetic energy.

$$W_{\text{tot}} = K_2 - K_1 = \Delta K$$

Concept Question

The piglet has a choice of three frictionless slides to descend. Along which slide would the piglet finish with the highest speed?

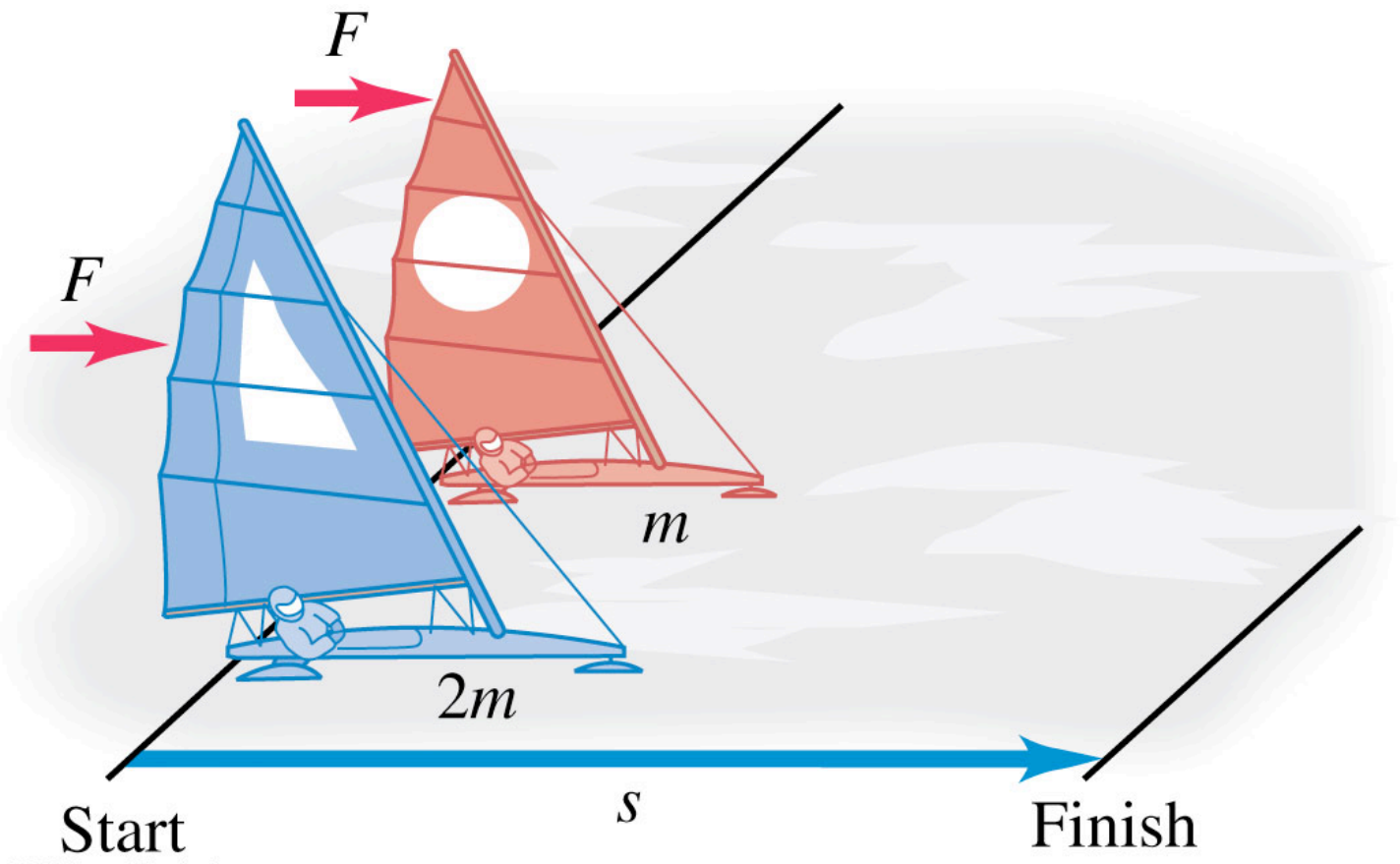


I. The final speed is the same for all.

J. Need more information.

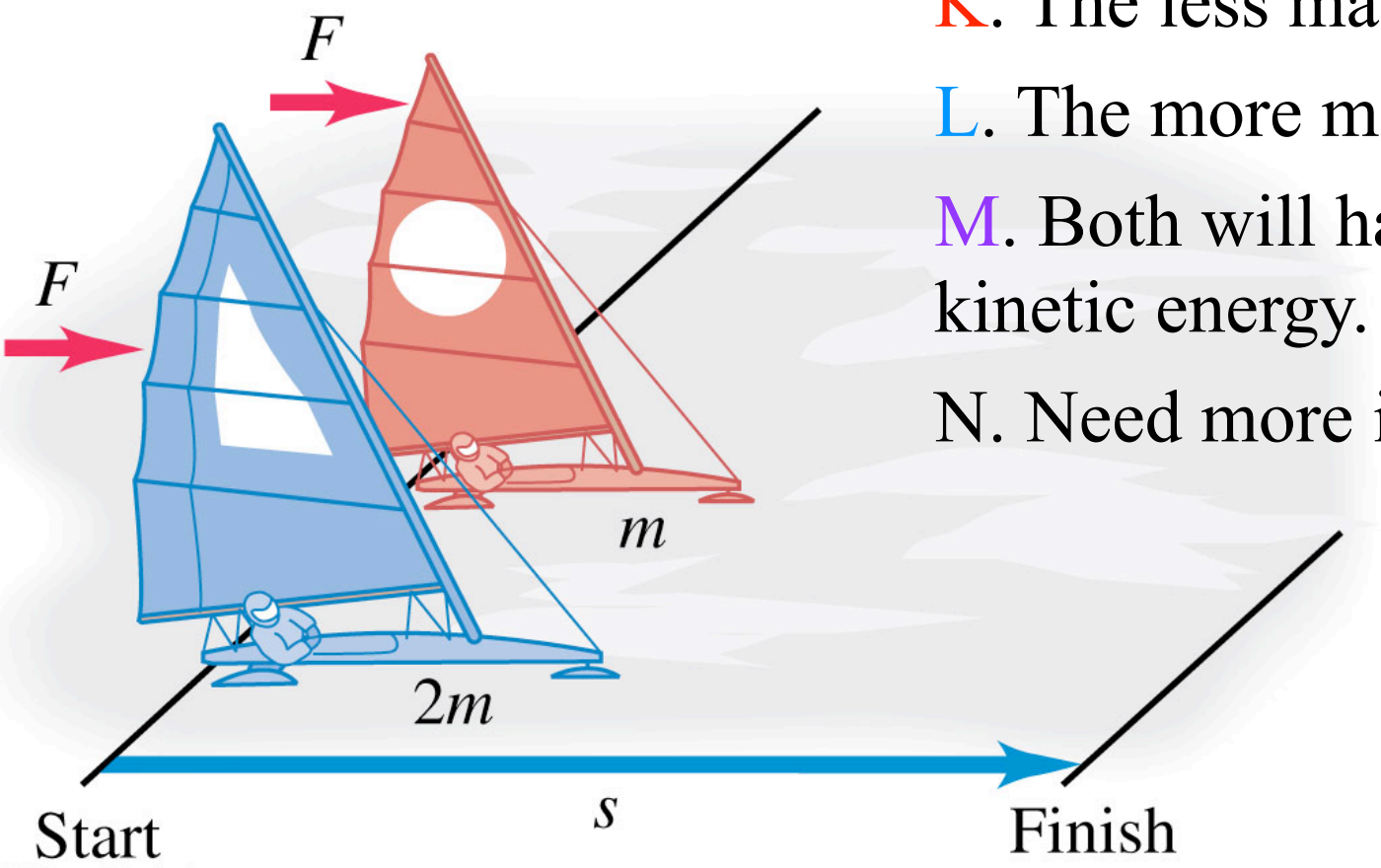
Comparing kinetic energies

- Two iceboats have different masses. The wind exerts the same force on them.
- Which will cross the finish line first?



Comparing kinetic energies

- Two iceboats have different masses. The wind exerts the same force on them. Which one has greater kinetic energy when they cross the finish line?



K. The less massive boat.

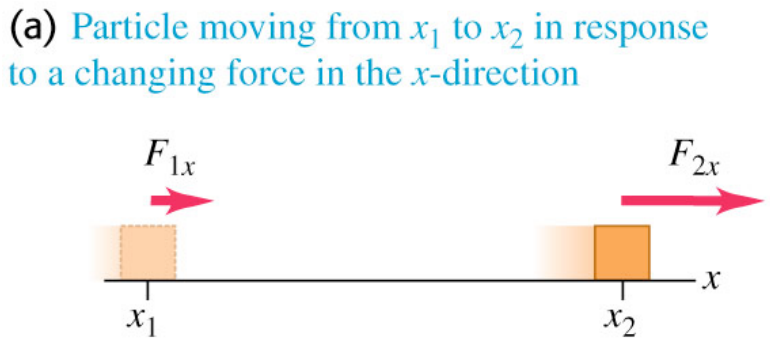
L. The more massive boat.

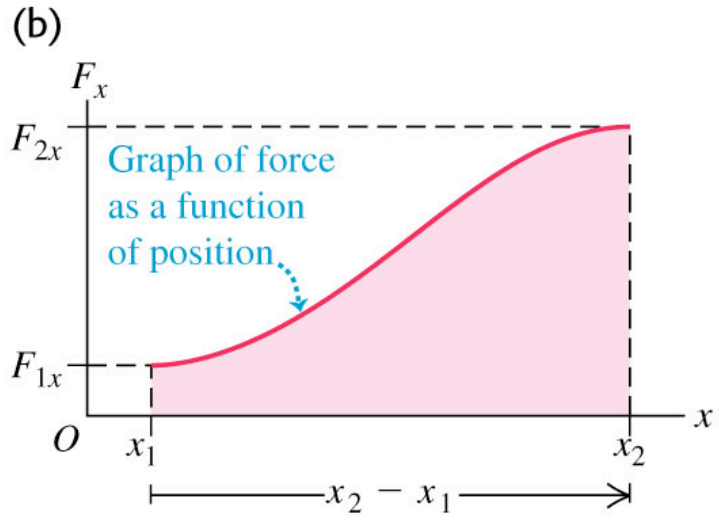
M. Both will have the same kinetic energy.

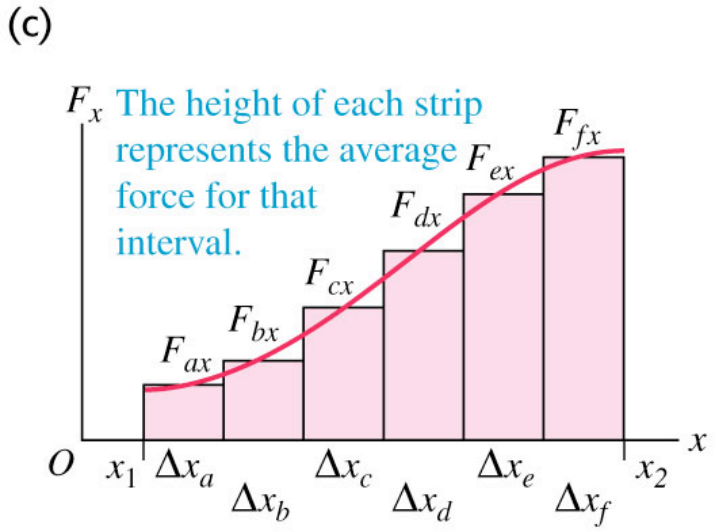
N. Need more infomation

Work and energy with varying forces—Figure 6.16

- Many forces, such as the force to stretch a spring, are not constant.
- In Figure 6.16, we approximate the work by dividing the total displacement into many small segments.

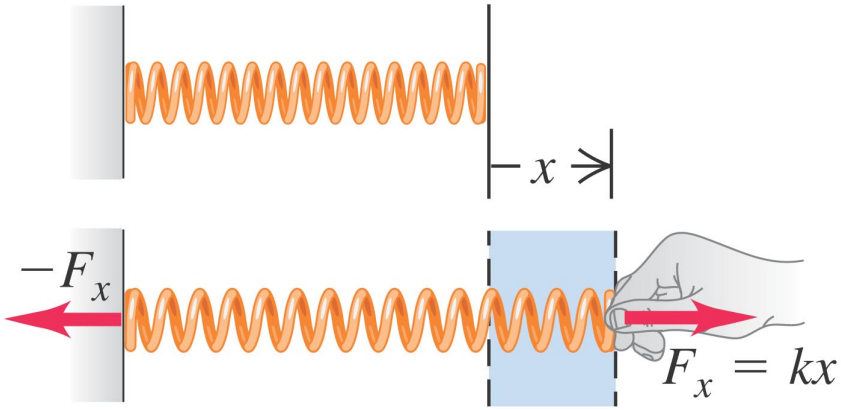




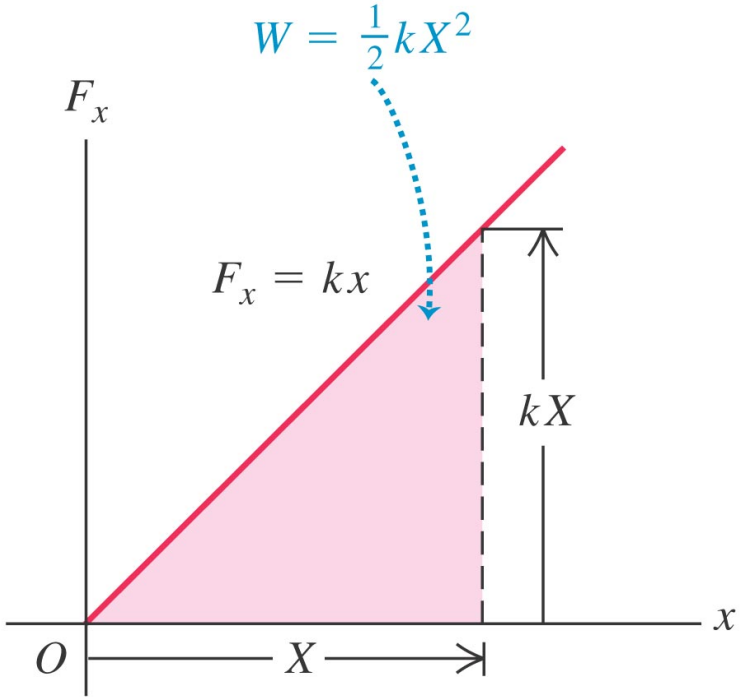


Stretching a spring

- The force required to stretch a spring a distance x is proportional to x: $F_x = kx$.
- k is the *force constant* (or *spring constant*) of the spring.
- The area under the graph represents the work done on the spring to stretch it a distance X: $W = 1/2\ kX^2$.

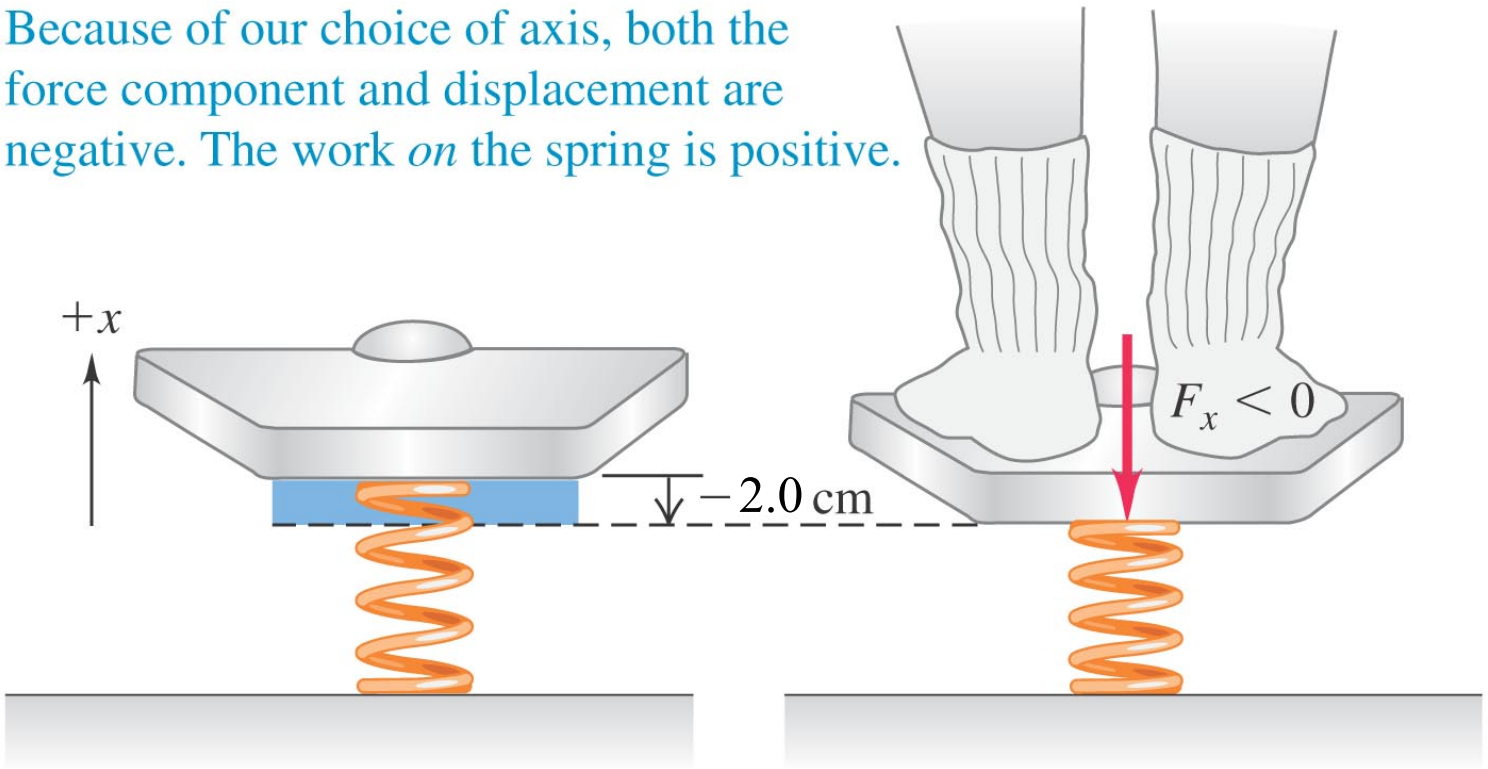


The area under the graph represents the work done on the spring as the spring is stretched from $x = 0$ to a maximum value X:



Work done on a spring scale

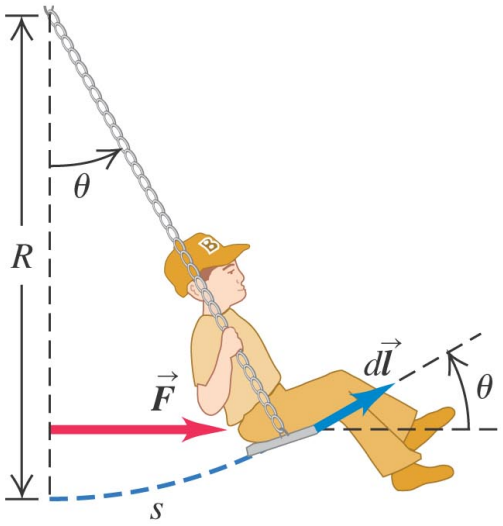
- A man weighing 700 N steps on a bathroom scale.
- How much work is done on the spring?



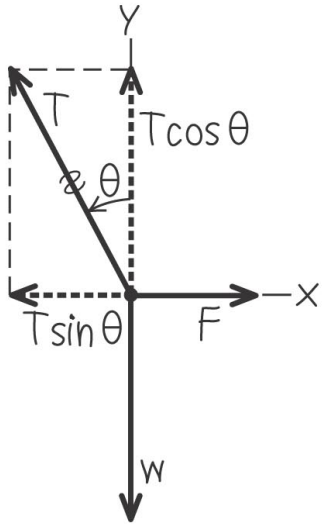
Motion on a curved path—Example 6.8

- A child on a swing moves along a curved path.

(a)



(b) Free-body diagram for Throckmorton (neglecting the weight of the chains and seat)



$$\text{Power} = \frac{\text{Work}}{\text{Time}}$$

- Average Power = $\Delta W/\Delta t$
- Instantaneous Power = dW/dt
- Units: (1 Joule)/(1 second) = 1 Watt
- (other units: horsepower, kilowatt)

Yoda uses The Force to lift a 5,600 kg X-wing fighter out of a swamp to a height of 1.4 m in 3.6 seconds. How much Force power can Yoda generate?

https://what-if.xkcd.com/3/