3. Determine the ratios of power: (a ratio is either #:1 or 1:# where the # is larger than 1)

Pecs/Triceps to Biceps	Legs to Pecs/Triceps	Legs to Biceps

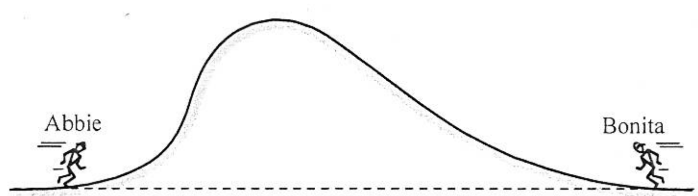
4. Which muscle group can exert the most amount of power? Why do you think this is?

Post Lab Questions:

1. A kilowatt-hour is the unit of energy electric companies use. This is 3,600,000 Joules. You can buy a kilowatt-hour of energy in Colorado right now for around 11.79¢ (the price changes due to the location and time of year). To get a feeling for how much a kilowatt-hour is, consider illuminating ten 100-watt light bulbs (that's 1,000 watts or 1 kilowatt). That's a lot of light. If you kept all of them burning for an hour, that would be a kilowatt-hour.
    a. How many stairs would you have to run up to create that much energy?

    b. Would you do that for 11.79¢?

2. Abbie and Bonita decide to race up a hill that is 30 meters high. It takes Abbie 45 seconds since her route is steep while Bonita runs up her path in 30 seconds. They both start from rest at the same height and stop at the top. Abbie has a weight of 700 N while Bonita has a weight of 500 N.



Is the work that Abbie does in going up the hill (a) *greater than*, (b) *less than*, or (c) *the same as* the work that Bonita does in going up the same hill? Explain.

$W = F \cdot \Delta y$

Abbie: $700 \cdot 30 = 21{,}000$ J

Bonita: $500 \cdot 30 = 15{,}000$ J

∴ Abbie does more work because she weighs more.

Is the power generated by Abbie's legs in going up the hill (a) *greater than*, (b) *less than*, or (c) *the same as* the power generated by Bonita's legs in going up the same hill? Explain.

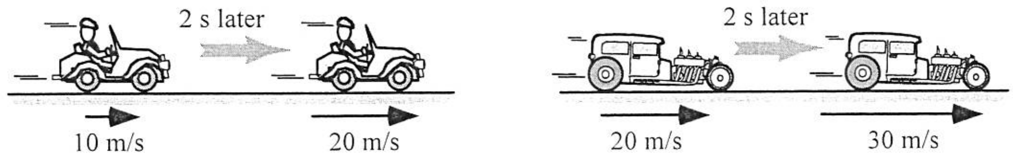
$P = \frac{W}{\Delta t}$

Abbie: $\frac{21000}{45} = 466.\bar{6}$ W

Bonita: $\frac{15000}{30} = 500$ W

Abbie has less power because it takes her longer to get to the top.

3. Amanda and Bertha are in a car race. Their cars have the same mass. At one point in the race, they both change their speeds in 2 seconds by 10 m/s. Ignore air friction.



Amanda Bertha

Is the work that Amanda's car does while speeding up (a) *greater than*, (b) *less than*, or (c) *the same as* the work that Bertha's car does while speeding up. Explain.

$W = \Delta K$

Amanda: $\Delta K = \frac{1}{2}m(v_f^2 - v_i^2) = 20^2 - 10^2 \left(\frac{m}{2}\right) = 300\left(\frac{m}{2}\right)$

Bertha: $\Delta K = \frac{m}{2}(30^2 - 20^2) = \frac{m}{2}(500)$

$\therefore$ Amanda < Bertha

Is the power generated by Amanda's car while speeding up (a) *greater than*, (b) *less than*, or (c) *the same as* the power generated by Bertha's car while speeding up? Explain.

b/c the time is the same, $W_A < W_B$ so $P_A < P_B$

4. The Tesla Model 3, with a mass of 1847 kg, in performance mode can accelerate from 0-60 mph in 3.2 seconds. Knowing there are 1,609 m in 1 mile, calculate the horse power of the model 3 in performance mode. (**278.2 hp**)

$P = \frac{Work}{\Delta t} = \frac{\Delta E}{\Delta t} = \frac{\Delta K}{\Delta t}$

$v_f = 60 mph \left(\frac{1609 m}{1 mi}\right)\left(\frac{1 hr}{3600 s}\right) = 26.816 \ m/s$

$\Delta K = K_f - K_i = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$

$= \frac{1}{2}(1847)(26.816)^2 - \frac{1}{2}(1847)(0)^2$

$= 664119.9 J$

$P = \frac{\Delta K}{\Delta t} = \frac{664119.9 J}{3.2 s} = 207537 W \left(\frac{1 hp}{746}\right)$

$= \boxed{278.2 hp}$