Flipping Physics Lecture Notes:

Introduction to Power

The rate at which work is done is called Power.

- $P = \frac{W}{\Delta t}$: Power equals work divided by change in time.
- $P = \frac{W}{\Delta t} \Rightarrow \frac{J}{s} = watts$: The units for Power are joules per second which we call watts.

$$P = \frac{W}{\Delta t} = \frac{Fd\cos\theta}{\Delta t} = F\left(\frac{d}{\Delta t}\right)\cos\theta = Fv\cos\theta$$

- Identify the force(s) delivering the power.
- θ is the angle between the force and the velocity.
- Use the magnitude of force and velocity in the power equation.

$\boxed{P = \frac{W}{\Delta t} = Fv\cos\theta}$ (There are essentially two equations for power.)

Work and change in time are both scalars, so *Power is also a scalar.*

$\boxed{746watts = 1.00hp}$ hp = horsepower

Why the work is the same in the two examples:

$W_{F_a} = F_a d\cos\theta$

$d = \Delta y\left(same\right)$ & $\theta = 0°\left(same\right)$

$\vec{a} = \frac{\Delta\vec{v}}{\Delta t} = \frac{0}{\Delta t} = 0$ & $\sum F_y = F_a - F_g = m\vec{a}_y = m\left(0\right) = 0 \Rightarrow F_a = F_g = mg\left(same\right)$

Therefore $W_{F_a} = F_a d\cos\theta\left(same\right)$