Power

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- Power is the rate at which work is done
- P = W/time (Joule/sec = Watt)

Work and Power are scalar quantities---they have magnitude and units but no direction.

Example

- If 3,000 Joule of work is performed on an object in 1.0 minute, what is the power expended on the object?

- $P = W/t = 3000 \text{ Joule}/(1 \text{ min})(60 \text{ s}) = 50 \text{ Watts}$

Example

- A 2,000 Newton Force is applied to an object that moves in the direction of the Force. If the object travels with a constant velocity of 10 m/s, calculate the power expended on the object.
- P = W/t = (F x D x cos(angle))/time
- = (F x cos(angle)) x (D/t)
- = 2,000 x 1 x 10 = 20,000 Watt

Power Expressions

- $P = W/t$ (Joule/sec = Watt)
- $P = F \times D/t = F \times V$ ((N x m/s) = Watts

Group Activity

- 1. A 780 N man does 8,580 J of Work in 12.3 s by running up three flights of stairs to a landing vertically above his starting point. Calculate the Power developed by the man developed during his run and his total vertical displacement.

Group Activity

- 2. A constant horizontal force of 6.0 N to the left is applied to a box on a counter to overcome friction. Calculate the power dissipated in moving the box 3.0 m to the left along the counter in 1.5 s.

Group Activity

- 3. In raising an object vertically at a constant speed of 2.0 m/s, the power developed is 18 Watts. Calculate the weight of the object.