

### Answer on Question #62117-Physics-Other

1. Contrast the metric units of distance, time, and speed. Describe the relationship between them.

#### Solution

The metric unit of distance is the meter ( $m$ ). Also we use for most purposes the other common metric units of distance - millimeters ( $mm$ ), centimeters ( $cm$ ) and kilometers ( $km$ ):

$$1\text{km} = 1000\text{m},$$

$$1\text{m} = 100\text{cm},$$

$$1\text{m} = 1000\text{mm}.$$

The metric unit of time is the second ( $s$ ). Also we use for most purposes the other common metric units of time – minutes and hours:

$$1\text{hour} = 3600\text{s},$$

$$1\text{min} = 60\text{s}.$$

The metric unit of speed is meters per second ( $\text{m/s}$ ). Another common metric unit of speed is kilometers per hour ( $\text{km/h}$ ).

Let's describe the relationship between the metric units of distance, time, and speed.

The metric units of speed are defined in terms of metric units of distance and time, speed is equal to distance divided by time:

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}.$$

The metric units of time are defined in terms of metric units of distance and speed, time is equal to distance divided by the speed:

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}.$$

The metric units of distance are defined in terms of metric units of speed and time, distance is equal to time multiplied by the speed:

$$\text{Distance} = \text{Time} \cdot \text{Speed}.$$

2. What is the metric unit of work expressed in base units?

(Hint: work = force  $\times$  distance, force = mass  $\times$  acceleration, acceleration = speed  $\div$  time)

#### Solution

$$W = Fd = mad = \frac{mvd}{t}$$

$$[W] = \left[ \frac{mvd}{t} \right] = \frac{[m][v][d]}{[t]} = \frac{kg \frac{m}{s} m}{s} = \frac{kgm^2}{s^2}.$$