

# Velocity & Acceleration Notes

Speed → how fast an object is traveling.

↳ scalar

↳ measured in m/s.

formula:

$$s = \frac{d}{t}$$

s = speed  
d = distance  
t = time

Velocity → how fast an object is traveling in a given direction.

↳ vector

↳ measured in m/s

formula:

$$v = \frac{\Delta d}{t}$$

v = velocity  
d = displacement  
t = time  
 $\Delta$  = change in

Acceleration → rate of change of velocity of an object over a certain amount of time.

↳ vector

↳ measured in  $m/s^2$

formula:

$$a = \frac{\Delta v}{t}$$

a = acceleration  
v = velocity  
t = time  
 $\Delta$  = change in

Examples:

① Mr. Patterson ran a mile in 8 minutes. How fast did he run the mile?

$$s = \frac{d}{t}$$

$$s = \frac{1 \text{ mile}}{8 \text{ min}}$$

$$s = 0.125 \frac{\text{miles}}{\text{min}}$$

convert to meters per second:

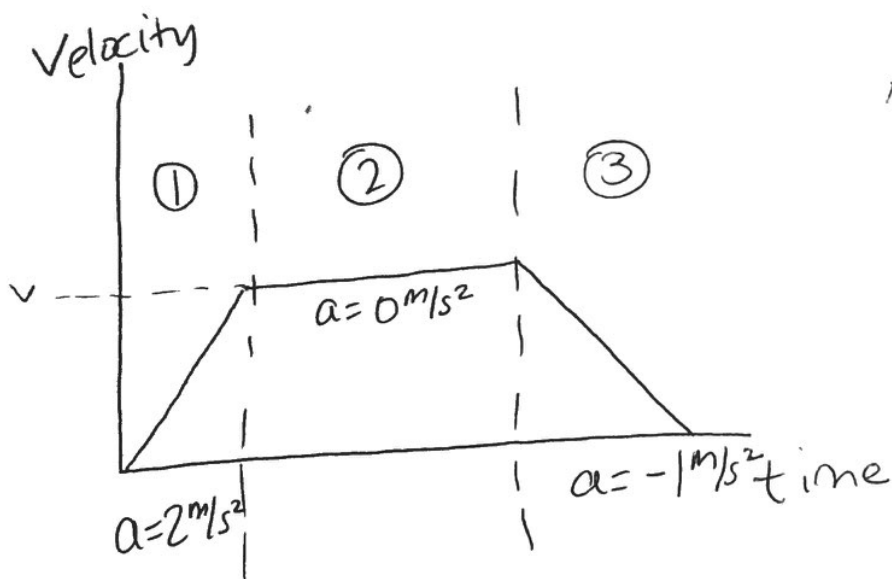
$$\frac{0.125 \text{ mi}}{\text{min}} \left| \frac{1609 \text{ m}}{1 \text{ mi}} \right| \frac{1 \text{ min}}{60 \text{ sec}} = \boxed{3.35 \text{ m/s}}$$

② Mr. Patterson is driving to school. He has to stop at a red light. When the light changes green, he speeds up to 20 m/s in 5 seconds. What was his acceleration?

$$a = \frac{\Delta v}{t} \quad a = \frac{20 \text{ m/s}}{5 \text{ s}} \quad \boxed{a = 4 \text{ m/s}^2}$$

Mr. Patterson increased his speed 4 m/s every second he was driving.

## Graphs



A velocity-time graph shows acceleration of the object. (slope)