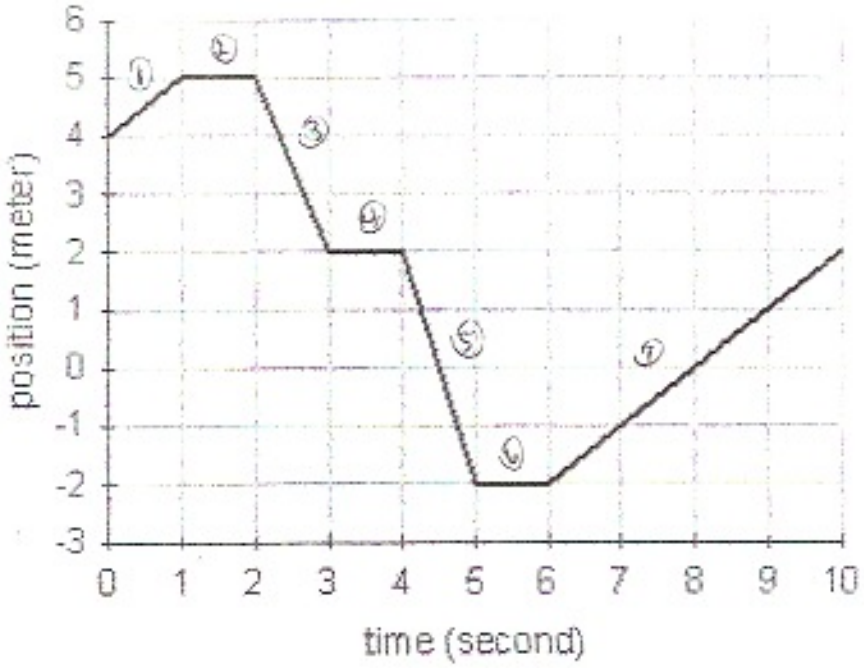
Station 1: Describe the movement of the object and calculate the velocity during each segment.



The object begins at a position $x = 4$ m. It moves forwards 1 meter to $x = 5$ m then holds still for 1 second. It then moves backwards to a position $x = 2$ m in 1 second, remains there for one second before moving backwards to $x = -2$ m in an additional second. The object remains at $x = -2$ m for one more second before moving forward to $x = 2$ m in 4 more seconds.

① $v = \frac{5-4}{1-0} = \frac{1}{1}$

$v = 1$ m/s

② $v = 0$ m/s

③ $v = \frac{2-5}{3-2} = \frac{-3}{1}$

$v = -3$ m/s

④ $v = 0$ m/s

⑤ $v = \frac{-2-2}{5-4} = \frac{-4}{1}$

$v = -4$ m/s

⑥ $v = 0$ m/s

⑦ $v = \frac{2-(-2)}{10-6} = \frac{4}{4}$

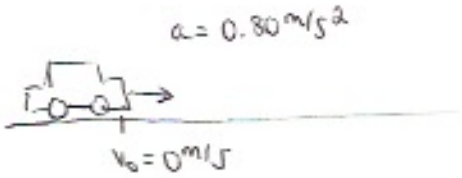
$v = 1$ m/s

Station 2:

A car begins at rest and accelerates at a uniform rate of 0.80 m/s².

A. How long does it take the car to move 67 m?

B. What is the car's velocity after it accelerates for 125 m?



A.) $t = ?$

$x = 67\ m$

$V_0 = 0\ m/s$

$a = 0.80\ m/s^2$

$x = v_0 t + \frac{1}{2} a t^2$

$67 = (0)t + \frac{1}{2}(0.80)t^2$

$67 = 0 + 0.4\,t^2$

$67 = 0.4 \cdot t^2$

$167.5 = t^2$

$\boxed{t = 12.9\ s}$

B.) $v = ?$

$x = 125\ m$

$V_0 = 0\ m/s$

$a = 0.80\ m/s^2$

$v^2 = v_0^2 + 2ax$

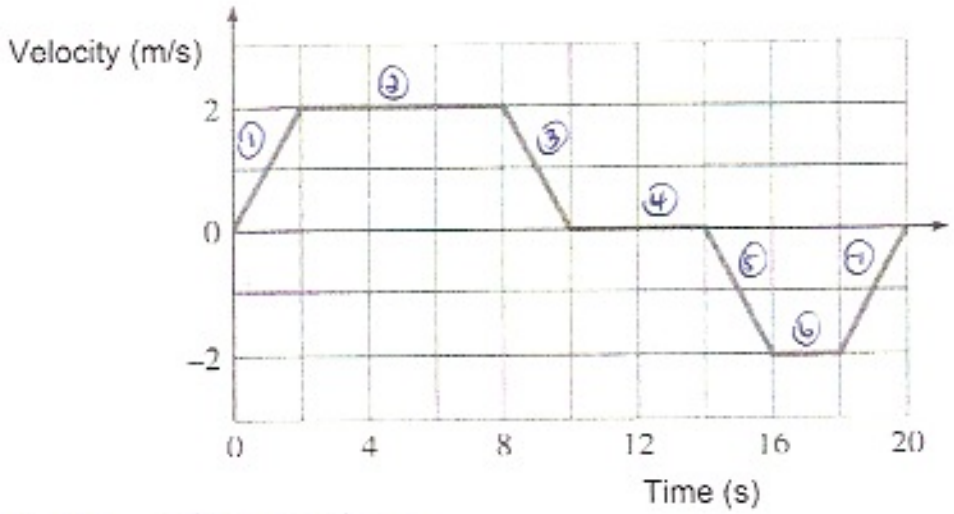
$v^2 = (0)^2 + 2(0.80)(125)$

$v^2 = 0 + 200$

$v^2 = 200$

$\boxed{v = 14.1\ m/s}$

Station 3: Use the velocity graph to calculate the acceleration during each segment. Use this information to sketch the acceleration vs. time graph.



From Velocity - take the slopes to get acceleration

① $\bar{a} = \frac{\Delta v}{\Delta t} = \frac{v_f - v_0}{t_f - t_0} = \frac{2-0}{2-0} = 1\ m/s^2$

② $\bar{a} = 0\ m/s^2$

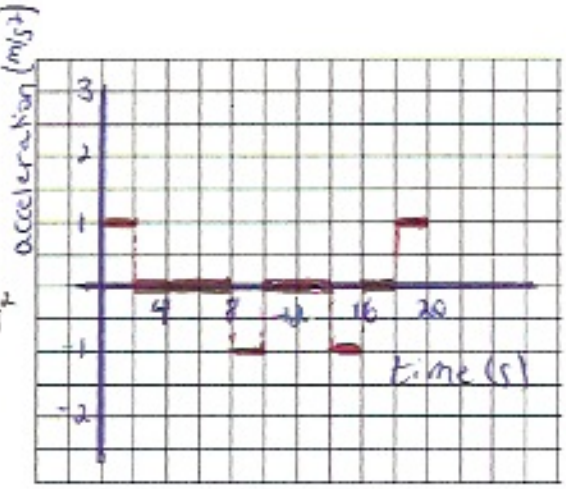
③ $\bar{a} = \frac{\Delta v}{\Delta t} = \frac{v_f - v_0}{t_f - t_0} = \frac{0-2}{10-8} = \frac{-2}{2} = -1\ m/s^2$

④ $a = 0\ m/s^2$

⑤ $\bar{a} = \frac{\Delta v}{\Delta t} = \frac{v_f - v_0}{t_f - t_0} = \frac{-2-0}{16-14} = \frac{-2}{2} = -1\ m/s^2$

⑥ $\bar{a} = 0\ m/s^2$

⑦ $\bar{a} = \frac{\Delta v}{\Delta t} = \frac{v_f - v_0}{t_f - t_0} = \frac{0-(-2)}{20-18} = \frac{2}{2} = 1\ m/s^2$

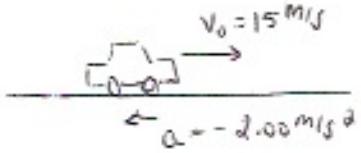


Station 4:

A driver of a car traveling at 15.0 m/s applies the brakes, causing a uniform acceleration of -2.00 m/s²

A. How long does it take the car to come to a velocity of 10.0 m/s?

B. How far has the car moved during the time found in part A?



A.) $t = ?$

$v = 10.0\ m/s$

$v_0 = 15\ m/s$

$a = -2.00\ m/s^2$

$v = v_0 + a t$

$10 = 15 + (-2.00)\, t$

$-5 = -2.00\, t$

$t = \frac{-5}{-2.00}$

$\boxed{t = 2.50\ s}$

B) $x = ?$

$v_0 = 15\ m/s$

$v = 10\ m/s$

$a = -2.00\ m/s^2$

$v^2 = v_0^2 + 2 a x$

$(10)^2 = (15)^2 + 2(-2.00) \cdot x$

$100 = 225 - 4.00 \cdot x$

$-125 = -4.00\, x$

$x = \frac{-125}{-4.00}$

$\boxed{x = 31.25\ m}$

OR

$x = ?$

$v_0 = 15\ m/s$

$a = -2.00\ m/s^2$

$t = 2.50\ s$

$x = v_0 t + \frac{1}{2} a t^2$

$x = (15)(2.50) + \frac{1}{2}(-2.00)(2.50)^2$

$x = 37.5 - 6.25$

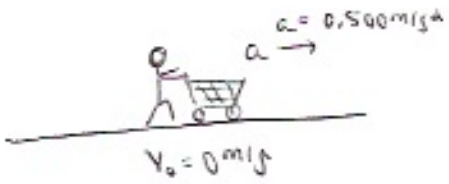
$\boxed{x = 31.25\ m}$

Station 5:

A person pushing a cart starts from rest and uniformly accelerates at a rate of 0.500 m/s^2.

A. What is the velocity of the cart after is has traveled 4.75 m?

B. What would the velocity be if the acceleration was 2.50 m/s^2 instead of 0.500 m/s^2 (still traveling 4.75 m)?



A.) $V = ?$

$x = 4.75\,m$

$V_0 = 0\,m/s$

$a = 0.500\,m/s^2$

$V^2 = V_0^2 + 2ax$

$V^2 = (0)^2 + 2(0.500)(4.75)$

$V^2 = 0 + 4.75$

$V^2 = 4.75$

$V = 2.18\,m/s$

B) $V = ?$

$x = 4.75\,m$

$V_0 = 0\,m/s$

$a = 2.50\,m/s^2$

$V^2 = V_0^2 + 2ax$

$V^2 = (0)^2 + 2(2.50)(4.75)$

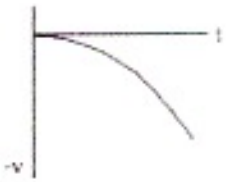
$V^2 = 0 + 23.75$

$V^2 = 23.75$

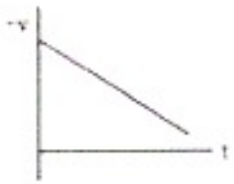
$V = 4.87\,m/s$

Station 6: All graphs shown below are **VELOCITY VS TIME** graphs. Please identify the following:

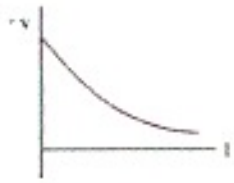
1. Which graphs show positive velocities?
2. Which graphs show negative velocities
3. Which graphs show positive accelerations?
4. Which graphs show negative acceleration?



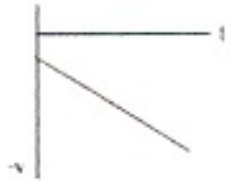
A



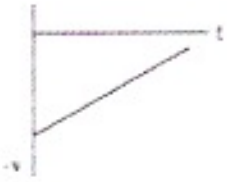
B



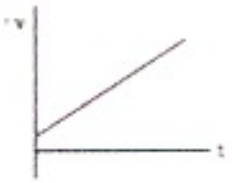
C



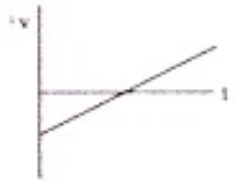
D



E



F



G

H

① POSITIVE VELOCITIES - Any graph where the line itself is ABOVE the x-axis → B, C, F, (Second half of G), H

② NEGATIVE VELOCITIES - Any graph where the line itself is BELOW the x-axis → A, D, E, (First half of G)

③ POSITIVE ACCELERATION - where the slope of the line is directed upwards → E, F, G, H

④ NEGATIVE ACCELERATIONS - where the slope of the line is directed downwards → A, B, C, D