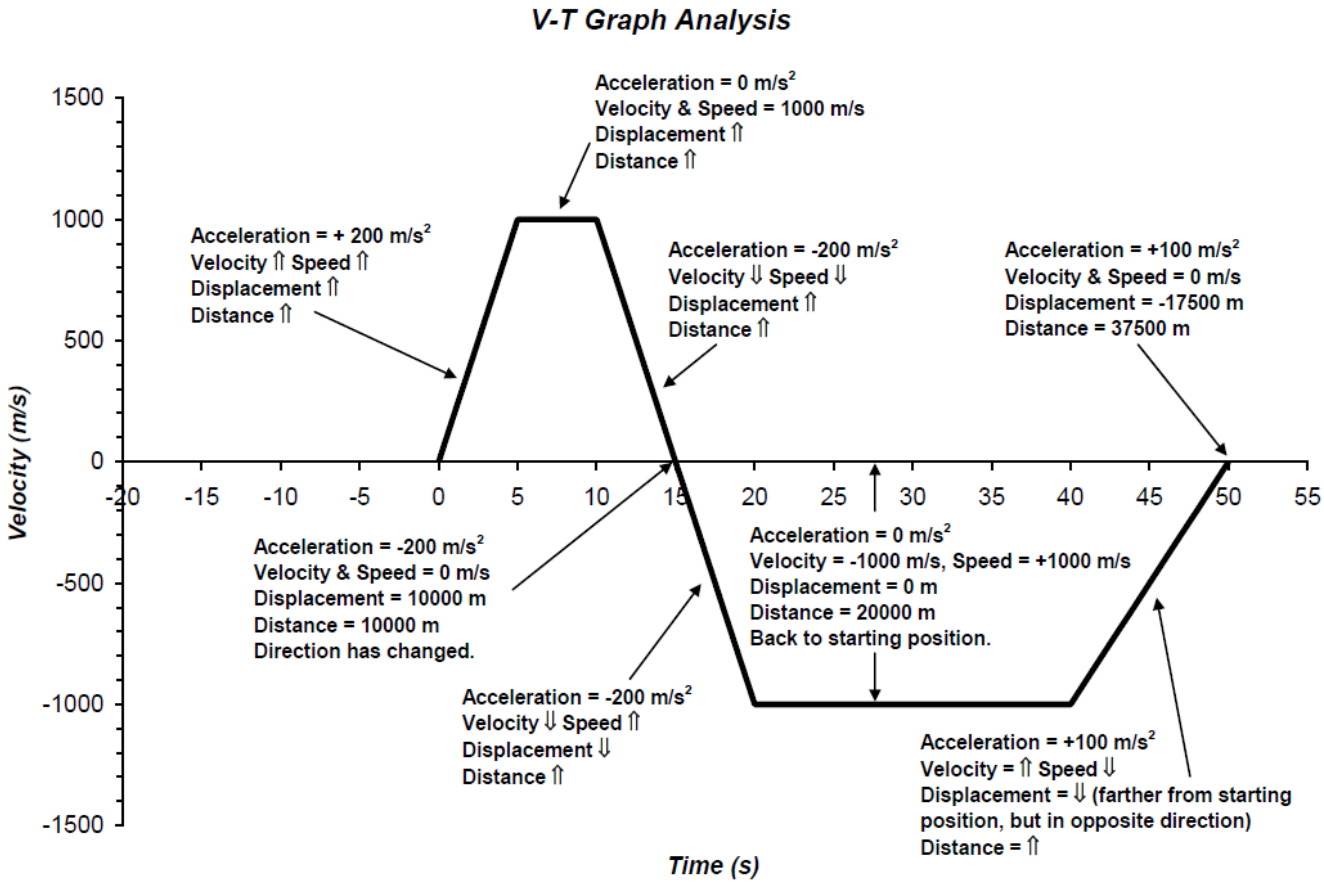
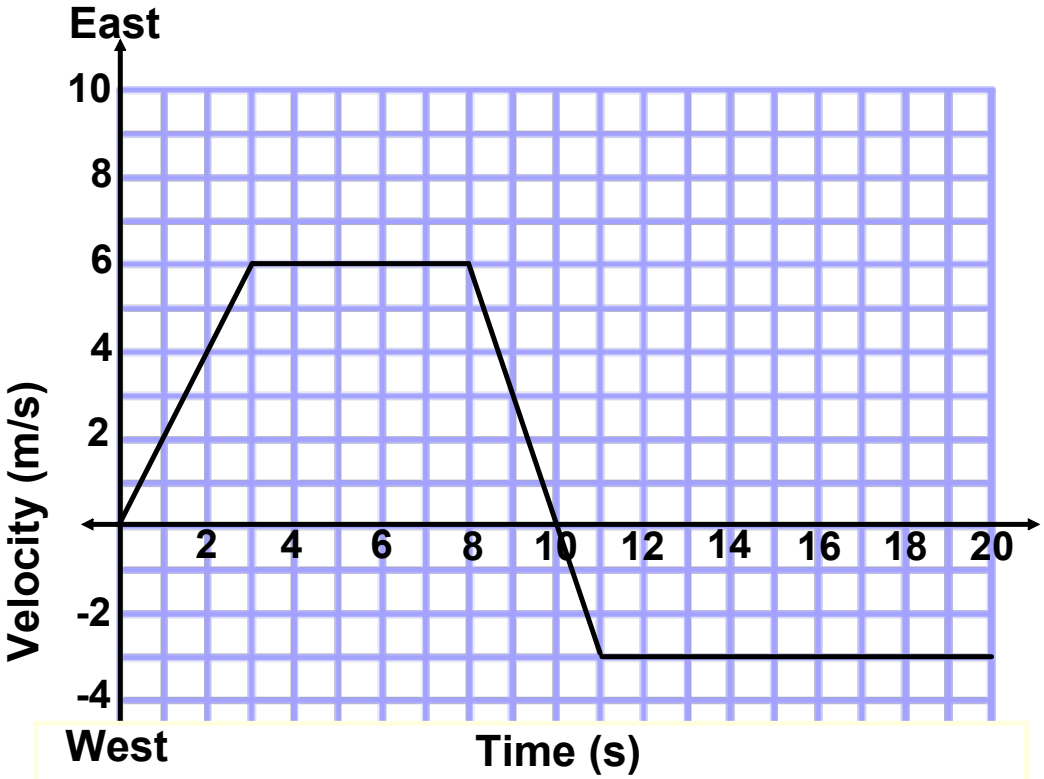


- Slope at any point is the instantaneous acceleration.
- Sign of the slope indicates the direction of the acceleration *not* the object.
- Distance travelled during a time interval is the sum of the areas contained between the graph and the time-axis.
- Displacement is the total area of the top minus the total area of the bottom.
- Average *velocity* is the object's *displacement* divided by the time.
- Average *speed* is the object's *distance* divided by the time.

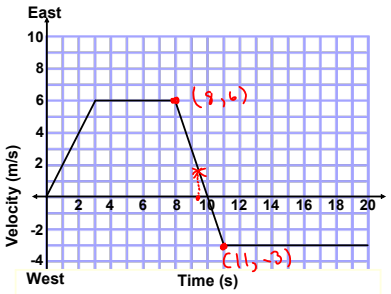
Velocity - Time Analysis Questions: Guided Practice



Qualitative Analysis (no calculations)

1. In what direction was the initial acceleration? [E]
2. Describe the direction of the velocity and acceleration between 8 and 11 seconds. Acc [W]; 8-10s [E], 10-11 [W]
3. For how many seconds was the object not accelerating? 14s
4. At what time(s) did the object change directions? 10s
5. Did the object spend more time traveling east or west? Same
6. In which direction did the object cover the most distance?
7. Was the final displacement of the object east or west of the starting point? [E]

Velocity - Time Analysis Questions: Guided Practice



Quantitative Analysis (calculations)

1. Calculate the initial acceleration.
2. Calculate the distance traveled during the first 6 seconds.
3. Calculate the total distance traveled east.
4. Calculate the total distance traveled west.
5. Calculate the displacement at the 20 s mark.
6. Calculate the average velocity and speed for the 20 s.
7. Calculate the acceleration at the 9.31 s mark.

1.) a = slope $\quad \boxed{a = 2\ m/s^2}$

$a = \frac{6-0}{3-0}$

2.) dist = area between graph and time axis.

$\text{Area} = \frac{(b_1+b_2)h}{2} = \frac{(3+6)(6)}{2}$

$\text{dist} = \frac{(9)(6)}{2} = \boxed{27\ m}$

3) $\text{dist}[E] = \frac{h(b_1+b_2)}{2} = \frac{6(5+10)}{2}$

$\boxed{\text{dist} = 45\ m}$

4) $\text{dist}[W] = \frac{h(b_1+b_2)}{2}$

$= \frac{3(9+10)}{2}$

$\boxed{\text{dist} = 28.5\ m}$ West distance

5) $\vec{d}$ = top area − bottom area

$= 45\ m - 28.5\ m$

$\boxed{\vec{d} = 16.5\ m}$ ← East of initial position (because answer is +)

6) $\vec{v}_{avg} = ?$ $\quad \vec{v}_{avg} = \frac{\vec{d}}{t} = \frac{16.5\ m}{20\ s}$

$\boxed{\vec{v}_{avg} = 0.83\ m/s}$

$v_{sp} = \frac{d}{t} = \frac{\text{Top Area} + \text{Bottom area}}{t}$

$= \frac{45+28.5}{20} = \frac{73.5\ m}{20\ s}$

$\boxed{v_{sp} = 3.7\ m/s}$

8) a = slope of line between (8,6) and (11,−3)

$= \frac{-3-6}{11-8} = \frac{-9}{3}$

$\boxed{a = -3\ m/s^2}$

Attachments

moving-man_all.jar