

5. A plane changes its velocity from 215 m/s [S] to 300 m/s [N]. The acceleration was 5.72 m/s^2 .
- Calculate the time it took for the plane to change its velocity. ($t = 90.0 \text{ s}$)
 - Calculate the displacement of the plane in that time. ($\vec{d}_f = 3830 \text{ m}$)
 - Calculate the distance the plane traveled in that time. Hint: find the distance the plane traveled in both the South and Northern directions. ($d = 11\,900 \text{ m}$)

c) Calculate dist traveled South:

$$a = 5.72 \text{ m/s}^2 \quad d_0 = 0 \text{ m}$$

$$v_0 = -215 \text{ m/s} \quad v_f^2 = v_0^2 + 2a(d_f - d_0)$$

$$v_f = 0 \text{ m/s} \quad \text{*point direction changed}$$

$$d_f = ? \quad 0^2 = (-215)^2 + 2(5.72)(d_f - 0)$$

$$-46225 = 11.44d_f$$

$$\text{South} \rightarrow -4041 \text{ m} = d_f \quad \text{dist South}$$

Calc. dist North

$$v_0 = 0 \text{ m/s} \quad a = 5.72 \text{ m/s}^2 \quad v_f^2 = v_0^2 + 2a(d_f - d_0)$$

$$v_f = 300 \text{ m/s} \quad d_0 = 0 \text{ m} \quad 300^2 = 0^2 + 2(5.72)(d_f - 0)$$

$$d_f = ?$$

$$90000 = 11.44d_f$$

$$7867 \text{ m} = d_f \quad \text{dist North}$$

$$\text{Total Dist: } 7867 + 4041 = \boxed{11908 \text{ m}}$$

\uparrow dist is always positive

4. Standing on the ground a person throws a spear. It leaves his hand with an upward velocity of 21 m/s
- Calculate the length of time the spear will be traveling upwards. ($t = 2.1$ s)
 - Calculate the spear's maximum height. ($d_f = 22.5$ m)
 - Calculate the velocity of the spear when it is 15 m above the ground. ($v_f = \pm 12.1$ m/s)


a) $t = ?$ $a = \frac{v_f - v_0}{t}$

$v_0 = 21 \text{ m/s}$

$d_0 = 0 \text{ m}$ $-9.81 = \frac{0 - 21}{t}$

$a = -9.81 \text{ m/s}^2$

$v_f = 0 \text{ m/s}$ $-9.81t = -21$



$t = 2.1 \text{ s}$

b) $d_f = ?$ $d_f = d_0 + v_0 t + \frac{1}{2} a t^2$

or

$$v_f^2 = v_0^2 + 2a(d_f - d_0)$$

$$0^2 = (21)^2 + 2(-9.81)(d_f - 0)$$

$$-441 = -19.62 d_f$$

$$22.5 \text{ m} = d_f$$

c) $v_f = ?$ $v_f^2 = v_0^2 + 2a(d_f - d_0)$

$d_f = 15 \text{ m}$

$d_0 = 0 \text{ m}$ $v_f^2 = (21)^2 + 2(-9.81)(15 - 0)$

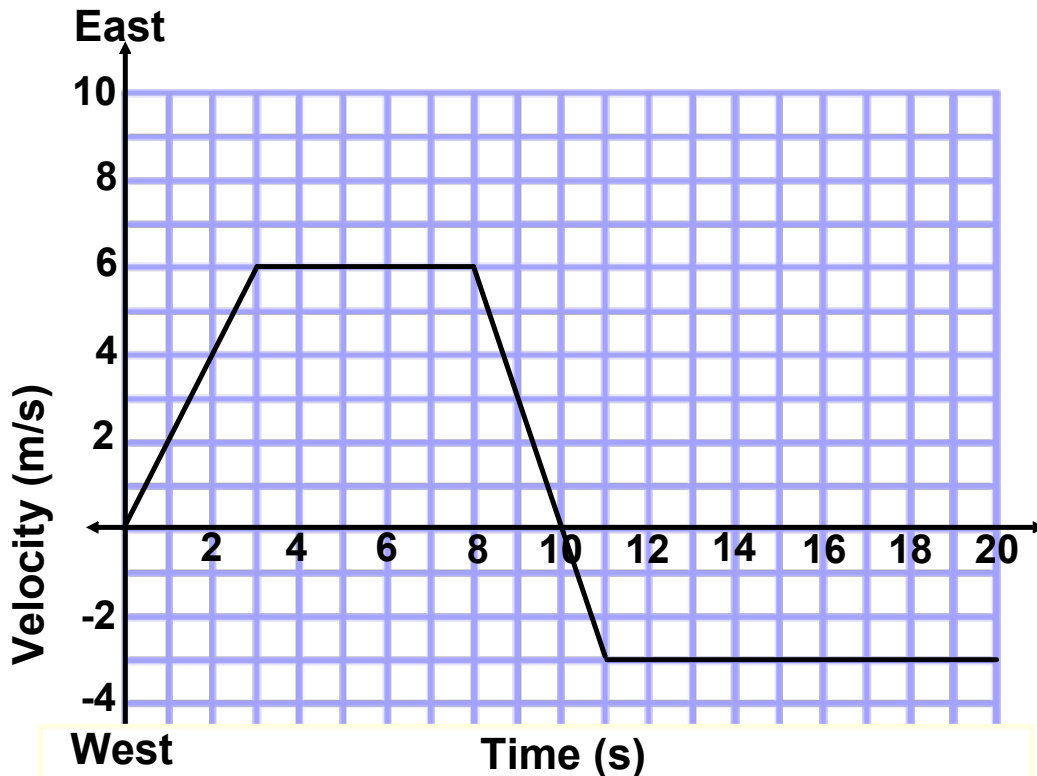
$v_0 = 21 \text{ m/s}$ $v_f^2 = 441 - 294.3$

$a = -9.81 \text{ m/s}^2$ $v_f^2 = 146.7$

$$v_f = \pm \sqrt{146.7}$$

$$v_f = \pm 12.2 \text{ m/s}$$

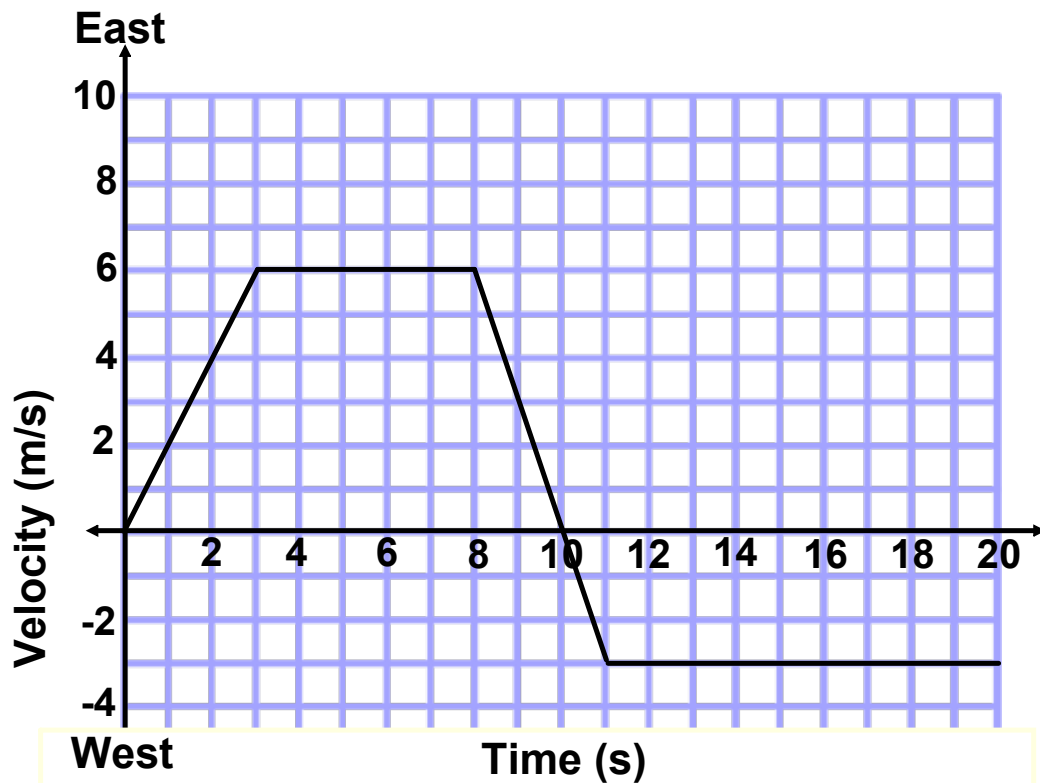
Velocity - Time Analysis Questions: Guided Practice



Qualitative Analysis (no calculations)

1. In what direction was the initial acceleration?
2. Describe the direction of the velocity and acceleration between 8 and 11 seconds.
3. For how many seconds was the object not accelerating?
4. At what time(s) did the object change directions?
5. Did the object spend more time traveling east or west?
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?

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.

Attachments

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