Velocity

Velocity is Speed with a direction.

- **Velocity is speed with a direction.**
- **To fully describe the velocity of an object direction information must be included.**
  - **+ means up or right**
  - **- means down or left**
  - **+ north or east**
  - **- means south or west**
- **Speed is a scalar and does not *keep track of direction*; velocity is a vector and is *direction-aware***

Average Velocity

- **Average velocity is the rate of change in position.**
- **The change in position is more commonly called the displacement.**

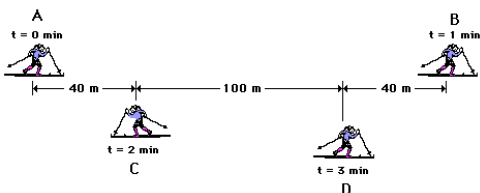$$\varpi\!\!\!v = \frac{\Delta x}{t}$$

$\overset{\omega}{v}$ = average velocity

ΔX = displacement

t = time

Calculating Avg. Speed & Velocity

The skier moves from A to B to C to D. Use the diagram to determine the average speed and the average velocity in m/s of the skier during these three minutes.

A — t = 0 min
B — t = 1 min
40 m — 100 m — 40 m
C — t = 2 min
D — t = 3 min

Calculating Avg. Speed & Velocity

$$s = \frac{d}{t} \qquad s = \frac{180\ m + 140\ m + 100\ m}{180\ s}$$

$$= \boxed{2.3\ \text{m/s}}$$

$$\varpi\!\!\!v = \frac{\Delta x}{t} \qquad \overset{\varpi}{v} = \frac{140m}{180s}$$

$$= \boxed{0.78\ \text{m/s}}$$

Practice

A gazelle travels 360 meters due south and then turns and travels 410 meters due north. After grazing for a while the gazelle travels 920 meters due south. What is the gazelle's displacement?

ΔX = -360 m + 410 m + -920 m   ΔX = -870 m

If it took the gazelle 20 minutes for the entire trip, what was the gazelle's average velocity?

$$\varpi\!\!\!v = \frac{\Delta x}{t} \qquad \overset{\varpi}{v} = \frac{-870m}{1200s}$$

$$\boxed{\overset{\omega}{v} = -0.725 m/s}$$