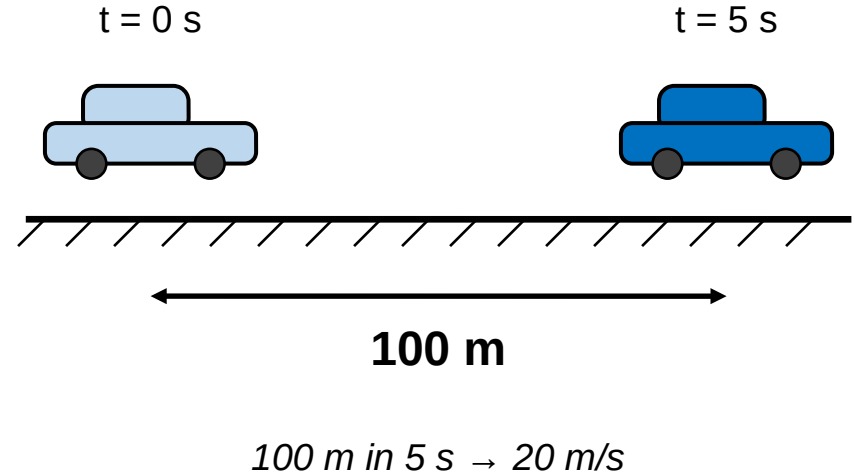


Essential Question

How do we describe how fast something moves?

Speed

- How fast an object moves
- $\text{Speed} = \text{distance} \div \text{time}$
- Unit: meters per second (m/s)



Velocity

- Speed with a direction
- A vector: size + direction
- Uses displacement, not distance



same speed, different velocity

The Velocity Equation

$$v = d / t$$

v

velocity (m/s)

d

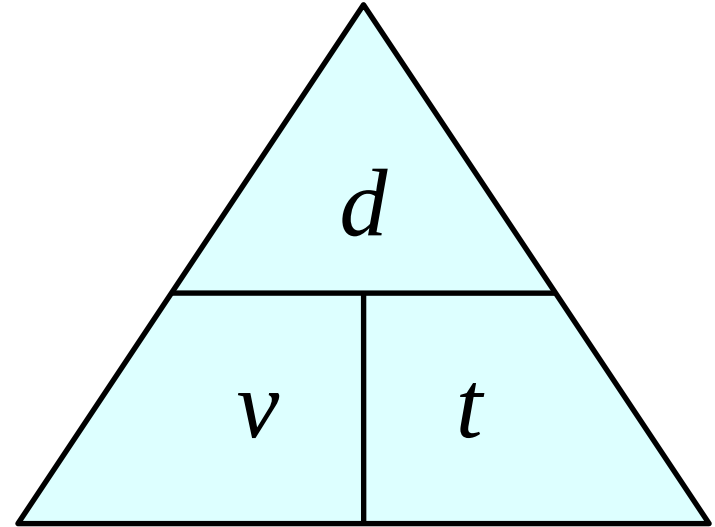
displacement (m)

t

time (s)

Solving for Any Variable

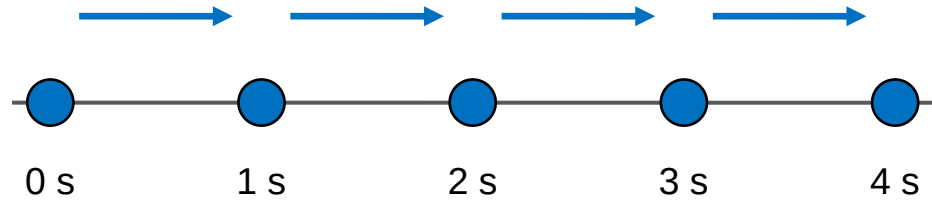
- Find velocity: $v = d/t$
- Find displacement: $d = vt$
- Find time: $t = d/v$



cover the one you want

Constant Velocity

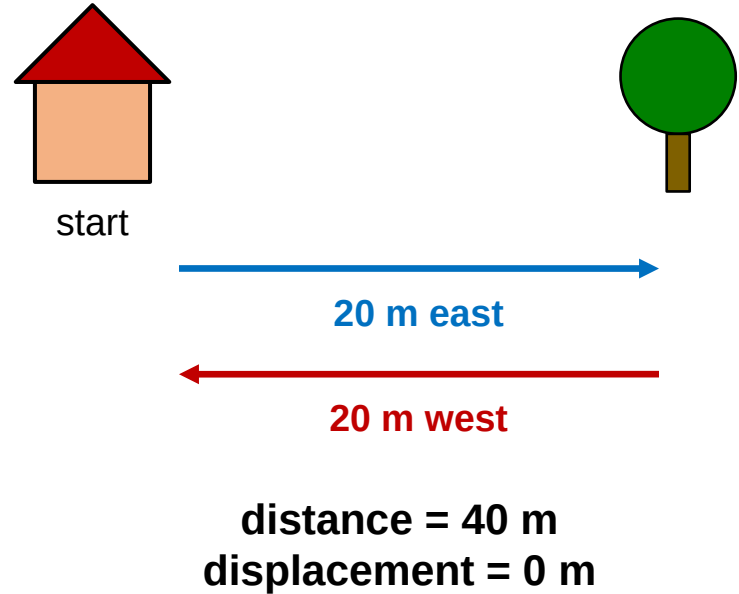
- Same displacement every second
- Same speed, same direction
- Equal spacing on a motion map



equal spacing = constant velocity

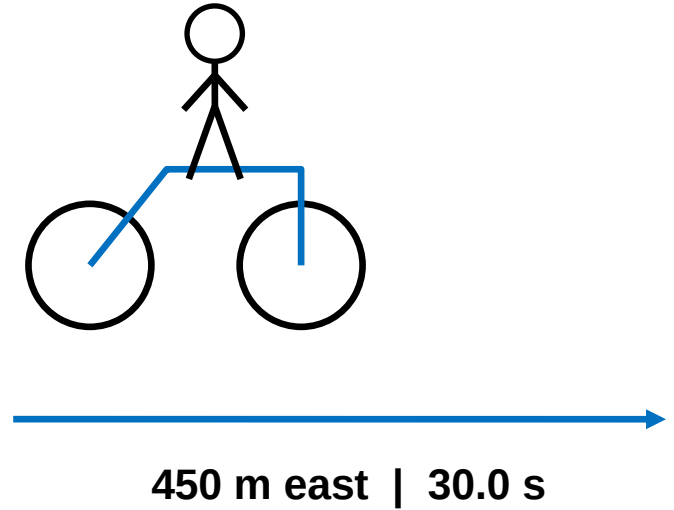
Average Speed vs. Average Velocity

- Average speed = total distance $\div$ time
- Average velocity = displacement $\div$ time
- Round trip: displacement = 0



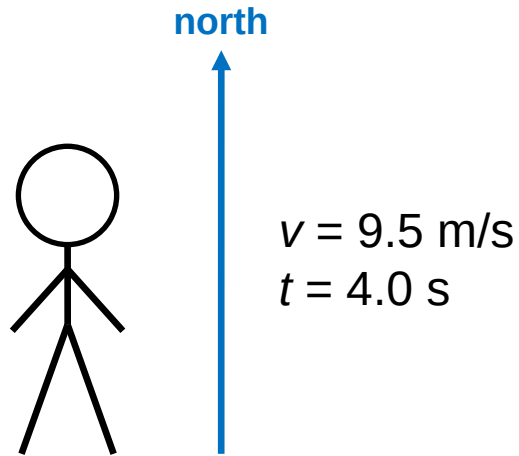
Example: Finding Velocity

A cyclist rides 450 m east in 30.0 s.
What is her average velocity?



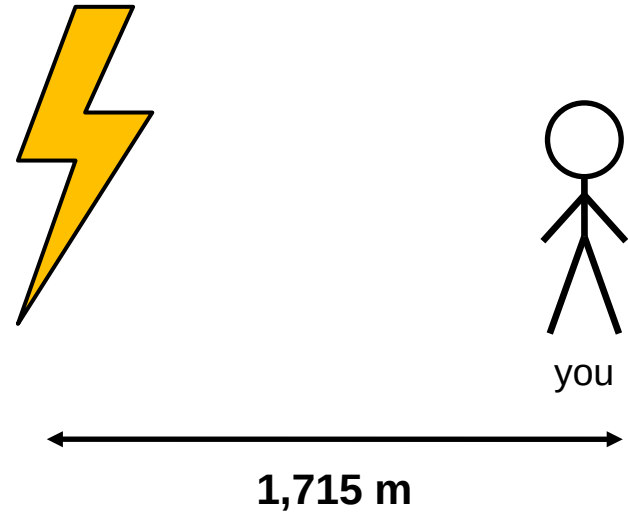
Example: Finding Displacement

A sprinter runs at a constant velocity of 9.5 m/s north for 4.0 s. What is his displacement?



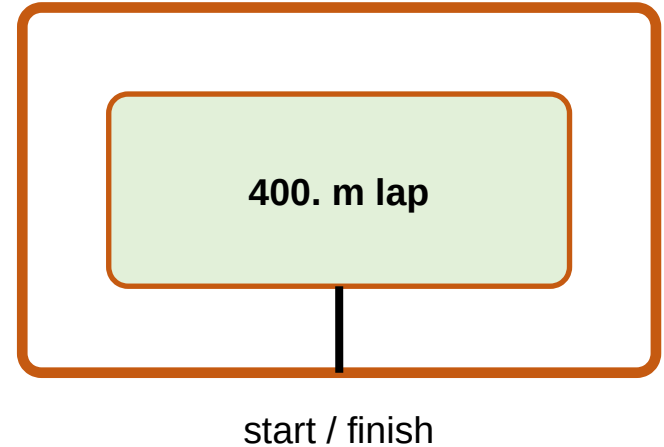
Example: Finding Time

Sound travels through air at 343 m/s .
How long does it take thunder to reach
you from a lightning strike $1,715 \text{ m}$
away?



Example: Speed vs. Velocity

A runner completes one 400. m lap of a track in 80.0 s and ends where she started. Find her average speed and her average velocity.



Big Ideas

- Speed = distance $\div$ time (no direction)
- Velocity = displacement $\div$ time (has direction)
- $v = d/t$, $d = vt$, $t = d/v$
- Round trip: average velocity = 0