Motion

Motion

- There are two types of quantities used to describe the motion of an object
  - Scalar quantities describe only the magnitude, or size
  - Vector quantities describe both magnitude and direction

Motion

- Position is the location of an object at one specific moment in time
  - Examples: Jim is 2mi north of the store, Karla is to the 1.5m left of Anna, Manuel is 5m from the finish line
  - It can be positive or negative
    - Forward, right, up, north, and east are generally considered positive directions
    - Backward, left, down, south, and west and generally considered negative directions
  - Variable is d

Motion

- Distance is how far an object has travelled
  - Examples: Bianca drove 15 miles, Geoffrey ran 400 meters, Karson jumped 3ft
  - It is always positive, which makes it a scalar quantity
  - It takes the entire journey into account
    - Example: The mouse walked 1m left, then 0.5m right, then 1m left, so the mouse covered a distance of 2.5m

Motion

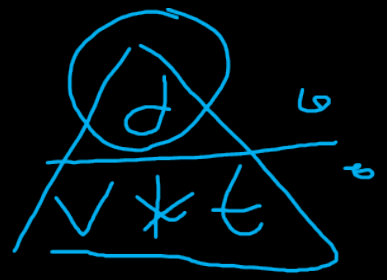
- Displacement is how far an object has travelled in a given direction
  - Examples: Young drove 15 miles east, Salazar ran 400 meters to the right, Missy jumped 3ft forward
  - Can be positive or negative, which makes it a vector quantity
  - Only takes initial and final position into account
    - Example: The mouse walked 1m left, then 0.5m right, then 1m left, so the mouse had a displacement of 1.5m left
  - If the final position is the same as the initial position, then the displacement is zero

Motion

- Speed is how far something travels in a given amount of time aka how fast
  - Speed is always positive, and therefore scalar
  - The variable is s
  - The unit is meters/second or m/s
  - Formula is $s = |\Delta d| / t$
    - This formula is not provided for you because you are expected to use the velocity formula and just ignore direction

Motion

- Velocity is how far something travels in a given amount of time AND in a given direction
  - Velocity can be positive or negative, and is therefore a vector
  - The variable is v
  - The unit is meters/second or m/s
  - Formula is v = Δd / t



Example Problems

d t

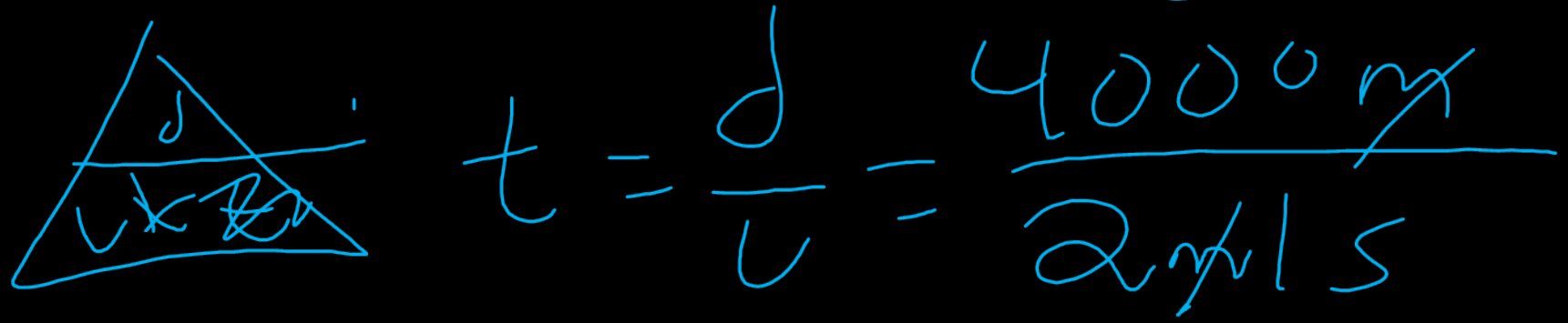
1. Speed Racer completed the 30km race in 15 minutes. At what speed must he have been traveling to do so?

v

$$v = \frac{d}{t} = \frac{30\,km}{15\,min} = 2\,km/min$$

Example Problems

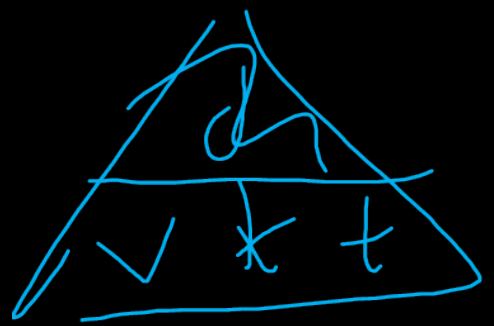
2. If Fred Flintstone drives to work at an average speed of 2.0m/s, how long will it take him to drive the 4000m?



2000 s

Example Problems

3. When spooked, Scooby Doo is capable of running 7m/s. How far will Scooby Doo get from the "ghost" if he runs for 35s?



$d = vt$

$(7\text{m}/\text{s})(35\text{s}) = 245\text{ m}$