

Graphing Distance and Speed Over Time

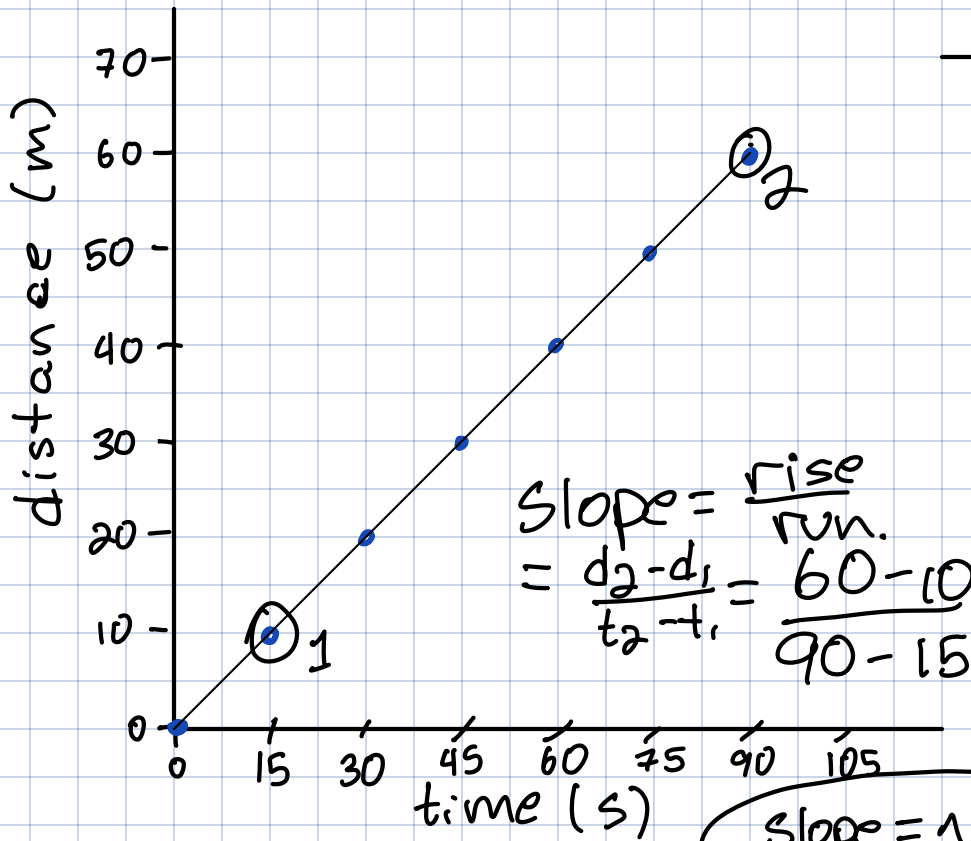
Distance

When we defined distance, we said that it was a length travelled along a path.

How can we show that in graph form?

Distance vs. Time.

man walking over time.



distance(m)	Time(s)
0	0
10	15
20	30
30	45
40	60
50	75
60	90

$$y = m x + b$$

$$\text{slope} = v = \frac{50\text{m}}{75\text{s}} = 0.67 \text{ m/s}$$

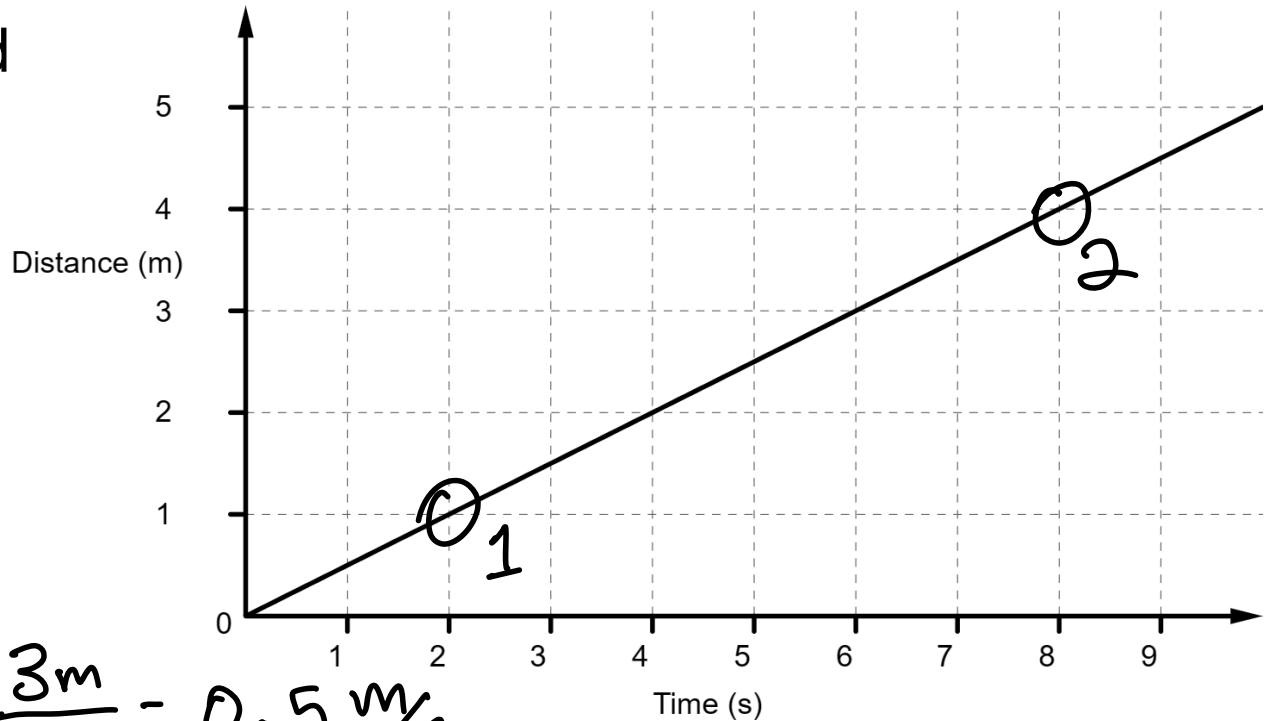
$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{rise}}{\text{run}}$$

(x_1, y_1) (x_2, y_2)

Distance

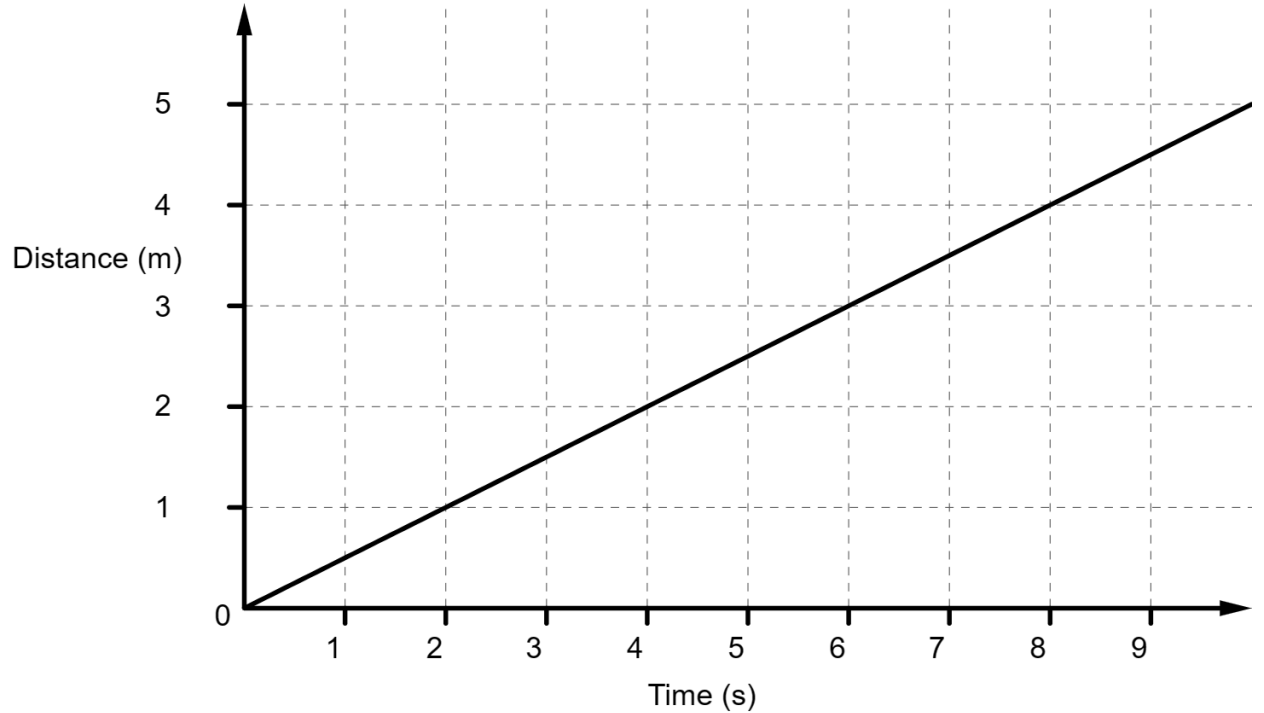
What kind of information can I find from this graph?

$$\begin{aligned}\text{Slope} &= \frac{\text{rise}}{\text{run}} \\ &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{d_2 - d_1}{t_2 - t_1} \\ &= \frac{4\text{m} - 1\text{m}}{8\text{s} - 2\text{s}} = \frac{3\text{m}}{6\text{s}} = 0.5 \text{ m/s}\end{aligned}$$



Distance

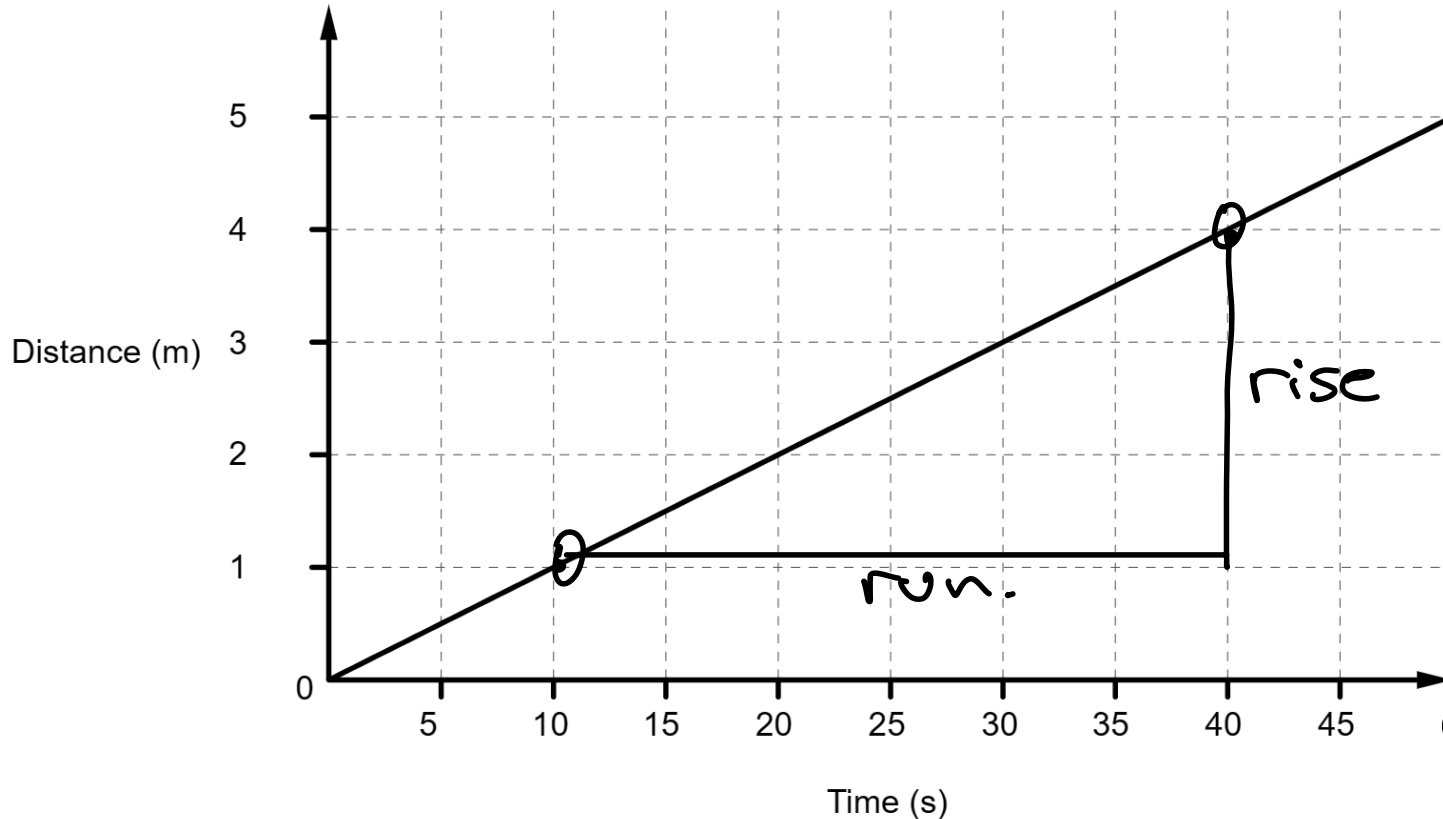
We can look at how our distance changes over time. Maybe we can calculate something



Speed

Find the speed from the following graphs

Speed



Slope?

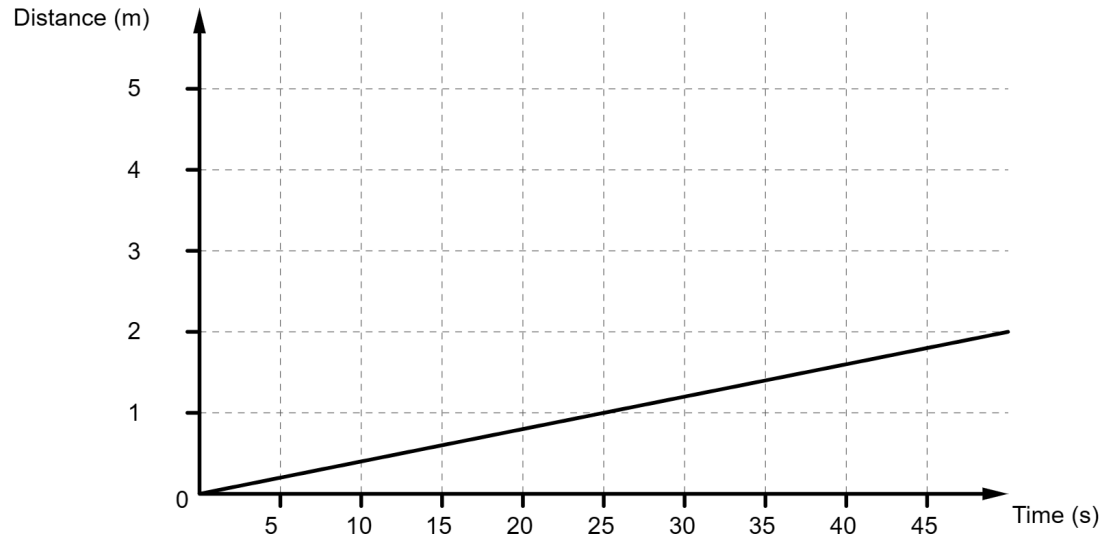
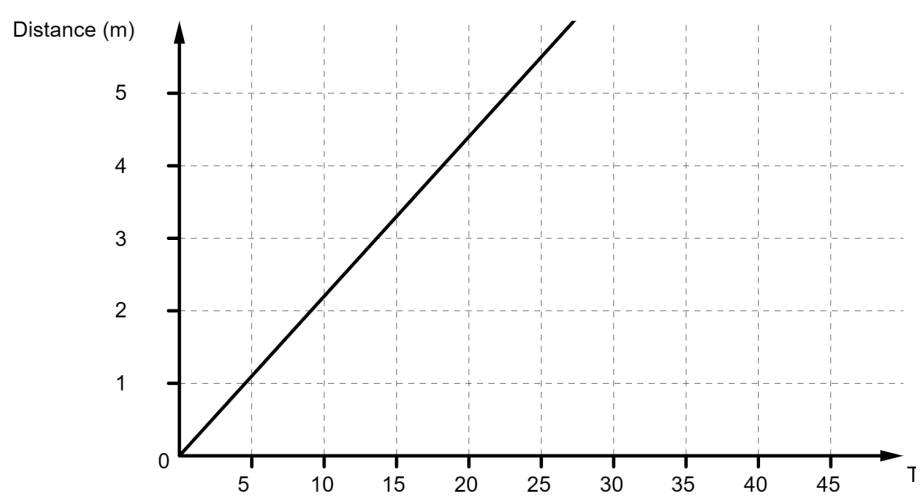
$$v = \frac{d_2 - d_1}{t_2 - t_1}$$

$$= \frac{4 - 1}{40 - 10}$$

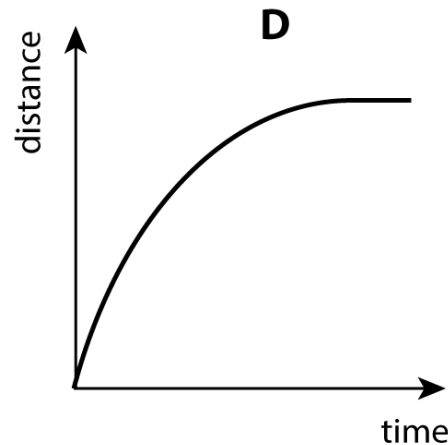
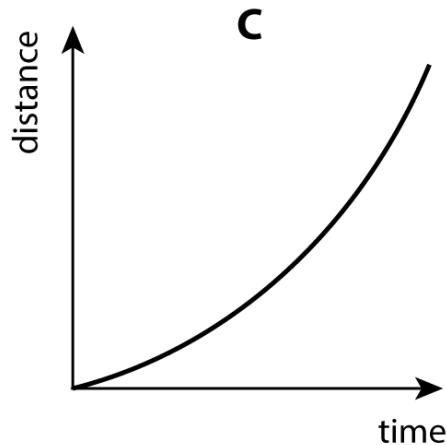
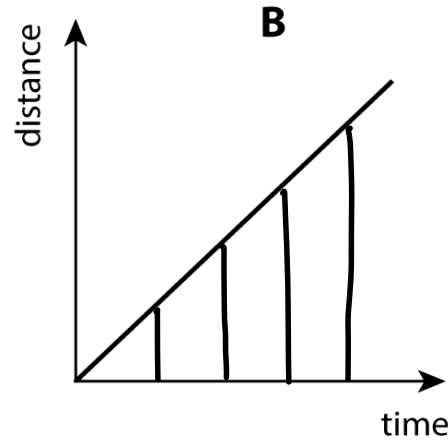
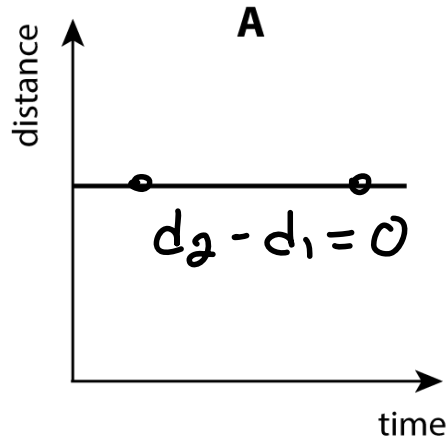
$$= \frac{3\text{m}}{30\text{s}}$$

$$= 0.1\text{m/s}$$

Speed



Graphing Distance

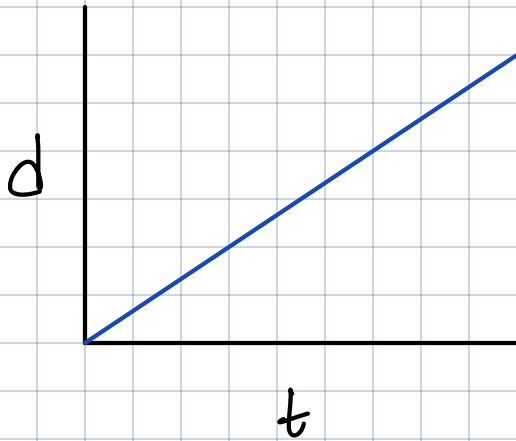


What type of motion does each graph show?

Is the object still, moving at a constant speed, getting faster, or getting slower?

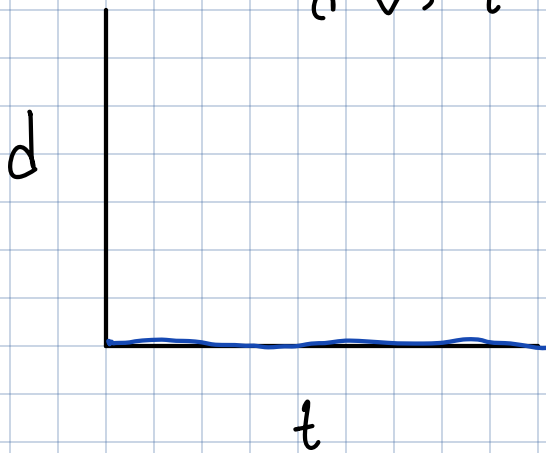
Sketch a d vs t graph that shows constant positive speed.

d vs t .



Sketch a d vs t graph that shows no motion.

d vs t



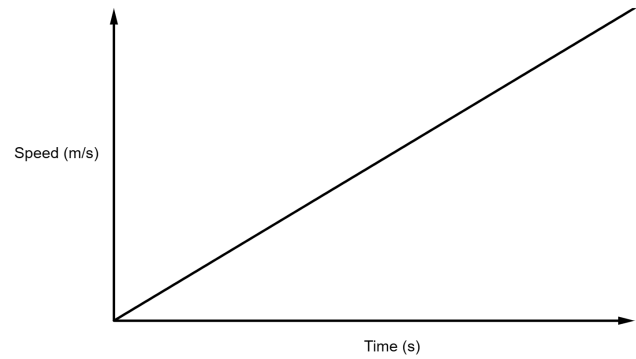
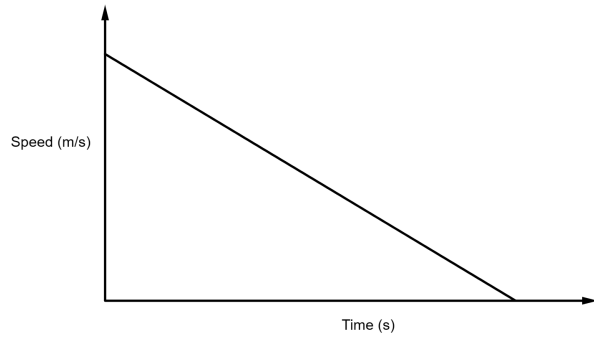
Speed

What if we graph speed against time?

What would I see if there is a constant speed?

Increasing or decreasing speed?

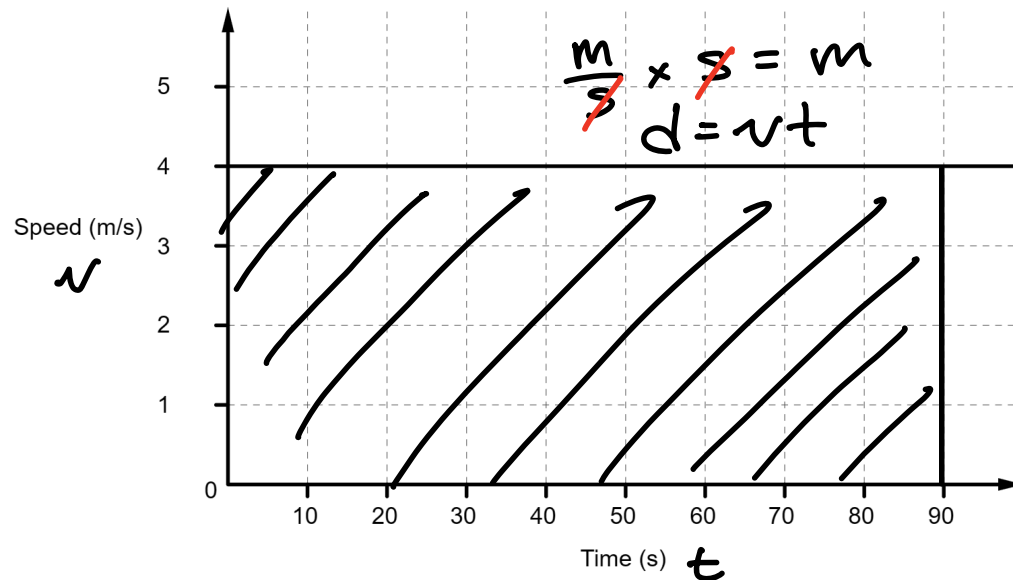
Speed



Speed

What do you notice about the units on the graph?

How could I use this graph to find distance travelled?



$$\text{Area} = b \times h$$

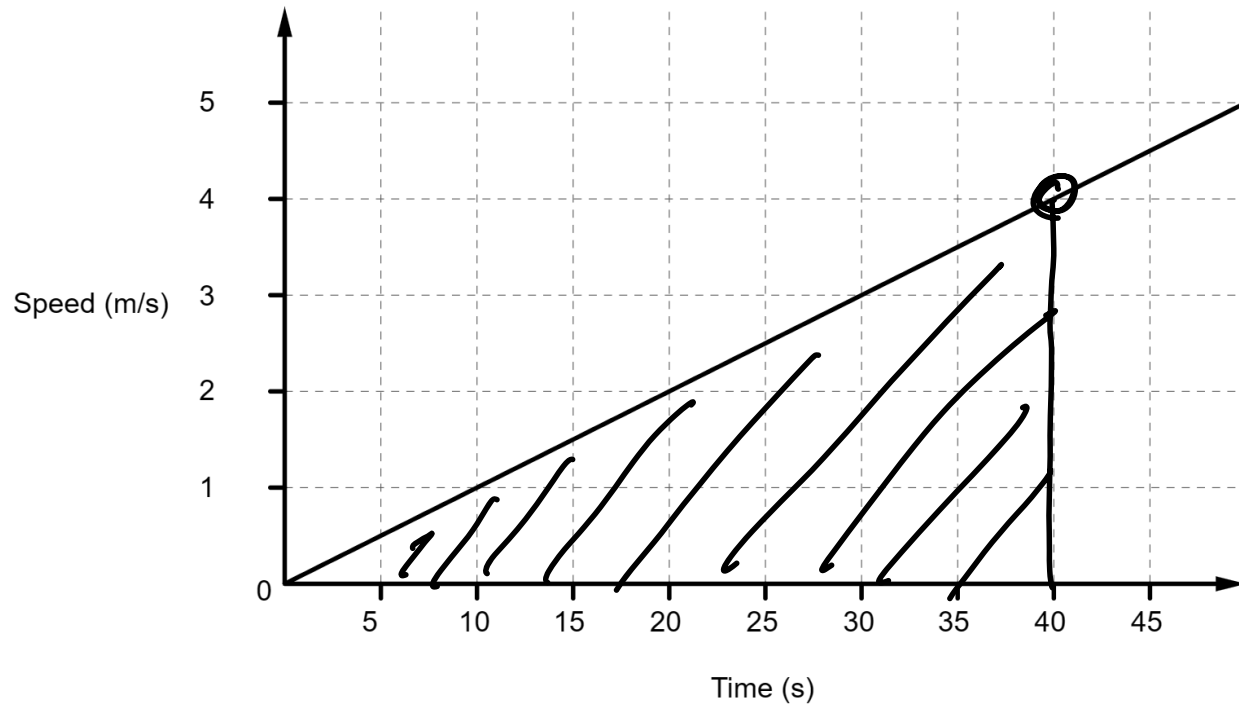
$$= t \times v$$

$$d = t \times v$$

$$= 90\text{s} \times 4\text{m/s}$$

$$= 360\text{m}$$

Speed



$$\begin{aligned} A &= d \\ &= \frac{bh}{2} \\ &= \frac{t \times v}{2} \\ &= \frac{40s \times 4m/s}{2} \\ &= 80m. \end{aligned}$$

Speed

The slope of a distance-time graph gives the average speed

The area of a speed-time graph gives the distance travelled!