# More speed, distance and velocity.

I drove 2.5 hours before stopping for gas. In that time I drove 190km out of my 480km trip. I want my average speed to be 80km/hr for the course of the trip. How fast must I drive for the second part of my journey?

$d = vt$

| | distance (km) | time (hr) | velocity (km/hr) |
|---|---|---|---|
| First Leg | 190 | 2.5 | 76 |
| Second Leg | 290 | 3.5 | 83 |
| Total | 480 | 6.0 | 80 |

We have three variables in our equation. If we know two of them we can get the other. We know two of three in row one and three.

What is my velocity in the first leg?

$d = vt$

$190 = v(2.5)$ $\rightarrow$ $v = \frac{190}{2.5} = 76 \frac{km}{hr}$

What is my total time taken?

$d = vt$ $\quad 480 = 80t$ $\quad t = \frac{480}{80} = 6.0\ hr.$

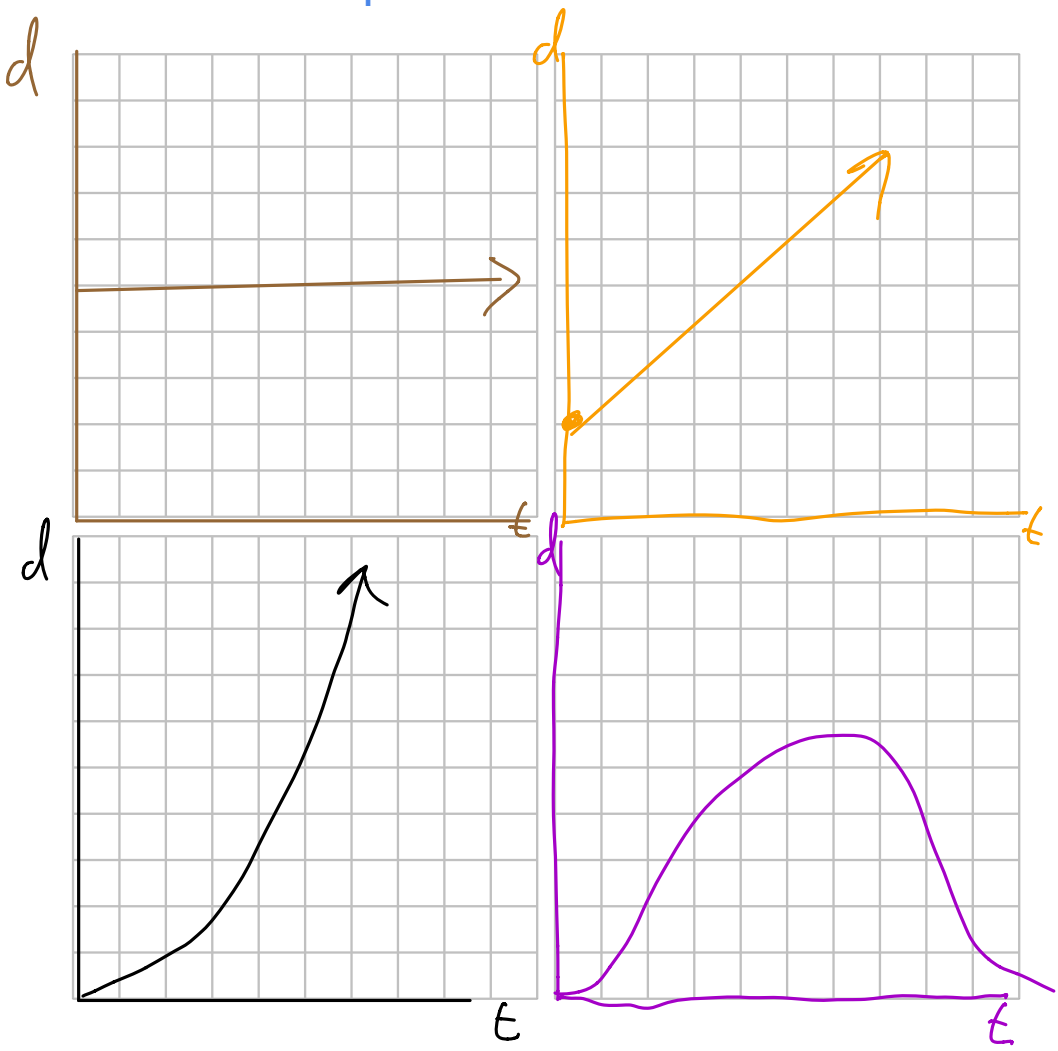
Now that I know two of three values in the first two columns, I can use addition / subtraction to fill in the missing values.

Finally, I can find my velocity for the second leg of my journey.

$d = vt$ $\quad 290 = v(3.5)$

$v = \frac{290}{3.5} = 82.9$

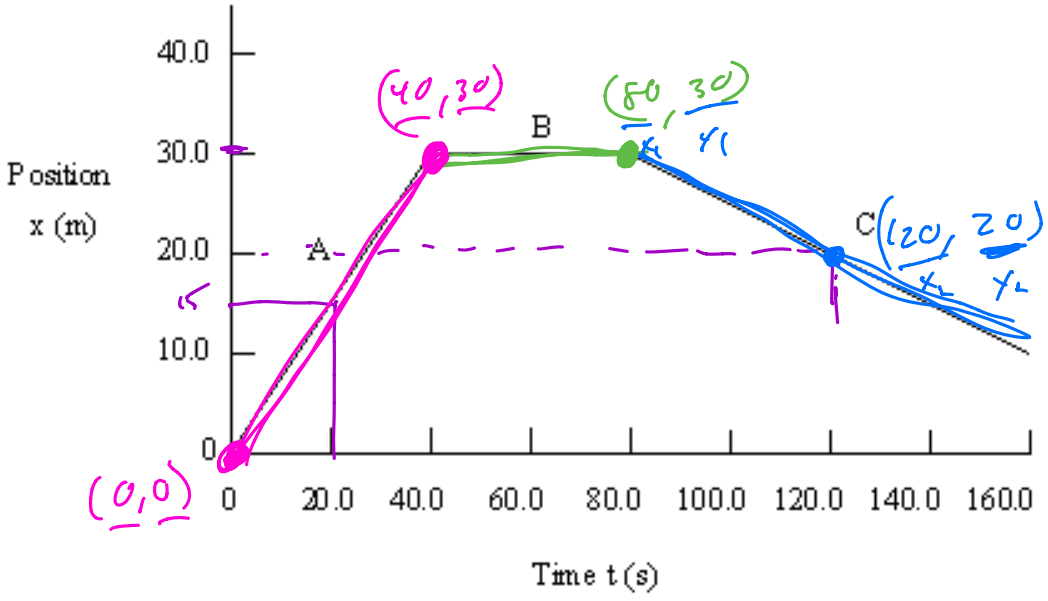
## Position vs Time Graphs:




We can see that the steepness of this line determines the velocity at which you travel.

$$d_f - d_i = v(t_f - t_i)$$

$$v = \frac{d_f - d_i}{t_f - t_i} \parallel m = \frac{y_2 - y_1}{x_2 - x_1}$$




What is the velocity at 20s? 60s? 120s?

$V_{20} = \frac{30-0}{40-0} = \frac{3}{4}\frac{m}{s}$ $V_{60} = \frac{30-30}{80-40} = 0\frac{m}{s}$ $V_{120} = \frac{20-30}{120-80} = -\frac{1}{4}\frac{m}{s}$

What does the slope of a velocity vs time graph represent?

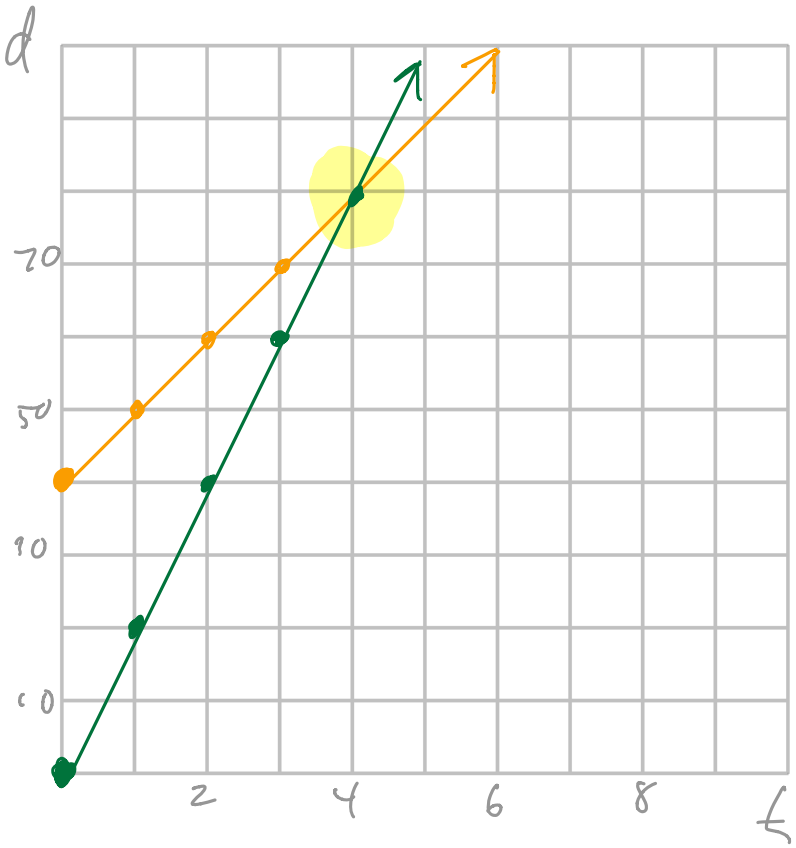
Acceleration

## Graphically Solving a Problem:

Jesse is standing 40 m away from an angry Godzilla. Clearly Jesse knows that he needs to run away. He does. Jesse runs away at $10\frac{m}{s}$. Godzilla is faster. He (she?) chases him at $20\ \frac{m}{s}$. How long will it take Godzilla to catch up to Jesse?

Jesse

Godzilla




When Godzilla catches Jesse they will both be at the same position.
ie: Their final distances are the same. $d_{Devon}=d_{Godzilla}$.

$$d_f = d_{0-Devon} + v_{Devon}t = v_{Godzilla}t$$

# Homework

A bullet travels 0.53 km in 3.0s. Find its speed in m/s.

An orbiting shuttle has a speed of $27x10^3 \frac{mi}{hour}$. How far will it travel in 10s?

Kelowna to Princeton (150 km) takes $1\frac{1}{3}$hours. Vancouver is another 275 km away, and takes a further 4 hours. What is the average velocity of the trip?

Suzy averages 90km/hour during 5 hours of daytime driving and 70 km/hour in 3 hours of night driving. What is her average speed?

Draw a position vs time graph. Label one line "Tom" and another "Richard". They both have constant velocity and Tom is travelling twice as fast as Richard. They start from the same position. The line labelled "Harry" starts 10 units away from Tom and Richard. He travels at the same velocity as Tom.

This graph is position vs time. Describe the motion