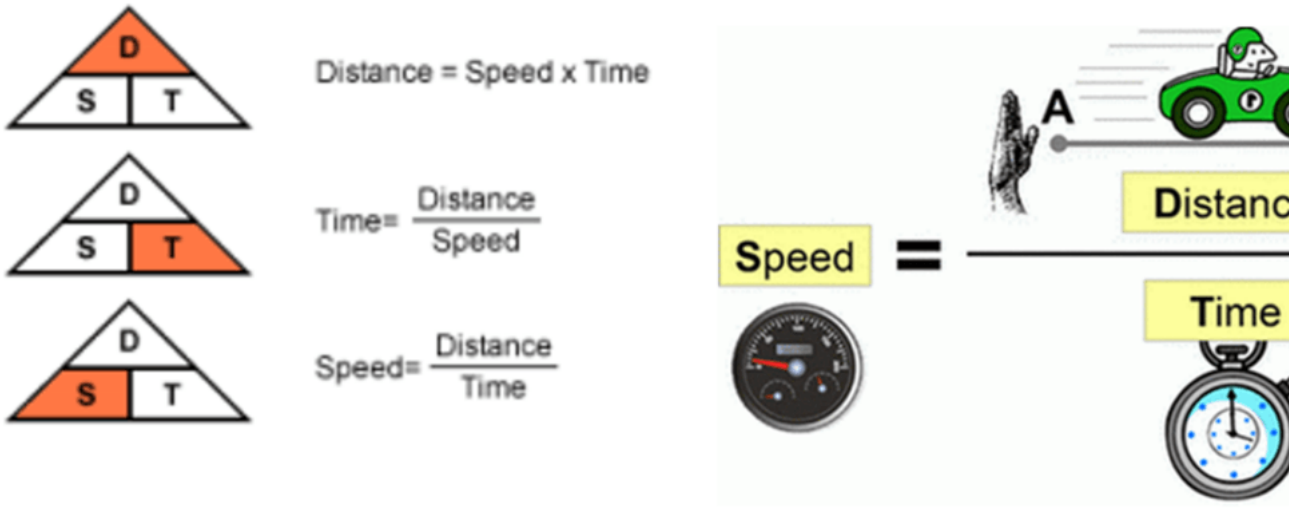
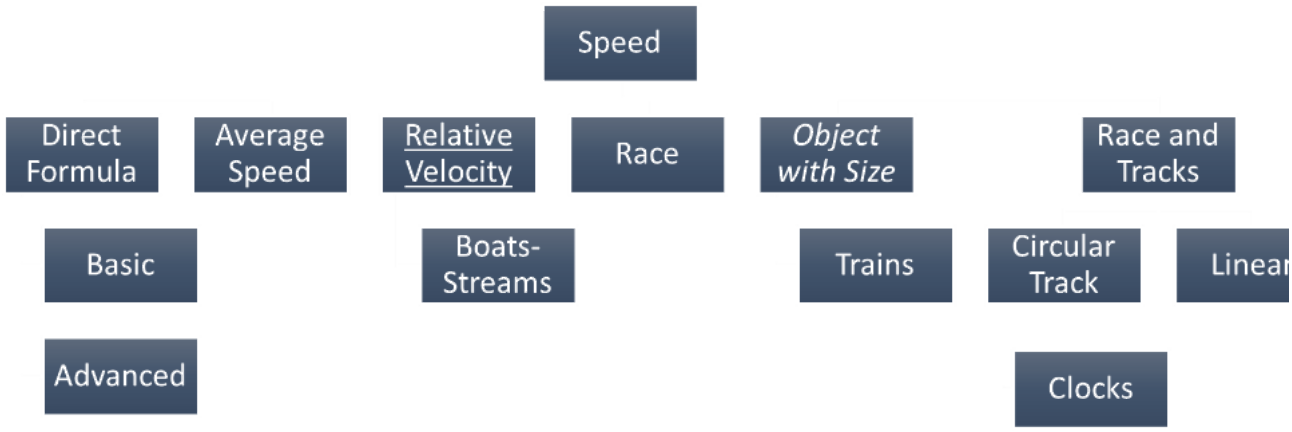
Speed Problems with Length of Objects (Trains, Platforms, Etc.) YouTube Lecture Handouts

Get video tutorial on: Examrace YouTube Channel





It common to all the problems to solve so far exactly they have to ignore the size of the objects which are traveling so consider the Train, when you standing on a platform the train take the fainant amount of the time to cross you.

We are specifically ask about the crossing of the train with the pole the time its take the train to cross a platform so, these problem with ask as deal with the length of the platform itself or length of the bridge.

So, there are two key concepts to imagine: one of the concepts of Relative Velocity and other is Object with size its example is Train.

Trains Approaching Each Other

Only three cases or problem with deal this:

1. Trains crossing a man or pole

Total distance $= l$

2. Trains crossing platform/bridges/tunnels

$p + l$

3. Trains crossing other trains

There are two trains either approaching to each other. It divided into two cases: Approaching and overtaking

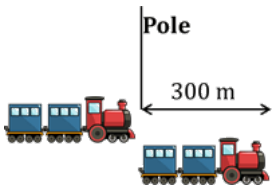
In case of approaching: $S_1 + S_2$ and $l_1 + l_2$

Overtaking: $|S_1 - S_2|$ and $l_1 + l_2$

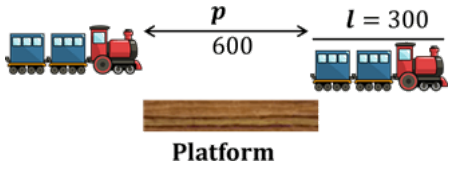
A Train of Length 300 M Can Cross a Pole in 8 Seconds. How Long Will It Take to Cross a Platform of Length 600 M?

Here, a train length $= 300m$

To cross a pole into 8 seconds



$$\text{Speed } \frac{300}{8}$$



$$\text{Distance} = 600 + 300 = 900$$

$$t = \frac{\text{distance}}{\text{speed}}$$

$$= \frac{900}{\frac{300}{8}}$$

$$= 3 \times 8 = 24 \text{ seconds}$$

A Train 120 M Long Passes a Milestone in 12 Seconds and Another Train of the Same Length Traveling in Opposite Direction in 8 Seconds. The Speed of the Second Train Is?

First scenario only talks about the milestone.

$$\text{A train} = 120m \text{ in the } 12 \text{ sec}$$

$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$

$$= \frac{120}{12}$$

$$= 10\frac{m}{\text{sec}}$$

$$\text{Speed} = S \text{ relative speed} = S + 10$$

$$\text{Total distance} = 120 + 120 = 240$$

$$\text{Time in the crossing is 8 sec, so, } t = \frac{240}{s + 10} = 8$$

$$s = \frac{20m}{\text{sec}}$$

Piku Noted That a Train to Delhi Took 8 Minutes to Pass Her. A Train in the Opposite Direction to Bombay Took 12 Minutes to Pass Her. The Trains Took 9 Minutes to Pass Each Other. Assuming Each Train Maintained a Constant Speed, and Given That the Train to Bombay Was 150 M Long, What Was the Length of the Train to Delhi?

We can define all the details:

	Bombay	Delhi
length of train	$150m$	l
took	12 min	8 min

Speed of Bombay $= \frac{150}{12} = \frac{m}{\min}$

Speed of Delhi $= \frac{\frac{l}{8}m}{\min}$

Relative speed $\Rightarrow \frac{150+l}{\frac{150}{12}+\frac{l}{8}} = 9$

$$150 + l = 9\left(\frac{100}{12} + \frac{l}{8}\right)$$

$$l = 300 \text{ meters}$$

A Train is Travelling at a Speed of 96 Km/Hr. It Takes $3S$ to Enter a Tunnel and 30s More to Pass through It Completely. What is the Length of the Train? What About the Tunnel?

Let convert $\frac{9600}{3600}$

$$= \frac{960}{36}$$

$$= \frac{\frac{80}{3}m}{\text{sec}}$$

A train takes 3 seconds to completely cross the starting it just a line

Length of the train $l = \frac{80}{\cancel{3}} \times \cancel{3} = 80$ meters

Length of the tunnel $p = \frac{80}{3} \times 30$

$$= 800m$$

The Length of the Bridge, Which a Train 130 M Long and Travelling at 45 Km/Hr Can Cross in 30 Seconds, Is?

The length of the bridge, a train $= 130m$

$$\frac{130+p}{\frac{4500}{3600}} = 30$$

$$130 + p = 30 \times \frac{45000}{3600}$$

$$p = 245m$$

A 300 M Long Train Crosses a Platform in 39 Seconds While It Crosses a Signal Pole in 18 Seconds. What is the Length of the Platform?

Crosses a single pole $S = \frac{300}{18}, \frac{p+300}{\frac{300}{18}} = 39$

$$p = 350m$$

Two Trains Are Running at 40 Km/Hr. And 20 Km/Hr. Respectively in the Same Direction. Fast Train Completely Passes a Man Sitting in the Slower Train in 9 Seconds. What is the Length of the Fast Train?

There are two trains.

A faster train crosses the slower train there are going in the same direction. Man sitting in slower train.

So the key here the man doesn't have a length.

Relative velocity of two train

$$\text{Speed} = 40 - 20$$

$$d = \left(\frac{\frac{20000}{3600}m}{\text{sec}}\right) \times 9 \text{ sec}$$

$$l = d = 50 \text{ meters}$$

A Train Overtakes Two Persons Who Are Walking in the Same Direction in Which the Train is Going, at the Rate of 2 Kmph and 4 Kmph and Passes Them Completely in 9 and 10 Seconds Respectively. Find the Length of Train?

There are two peoples who are walking and train is coming and crossing that.

Converting speed $= 2 \times \frac{5}{18} \frac{m}{\text{sec}} \frac{\frac{20}{18}m}{\text{sec}}$

$$\frac{l}{s - \frac{10}{18}} = 9$$

$$\Rightarrow \frac{l}{s - \frac{20}{18}} = 10$$

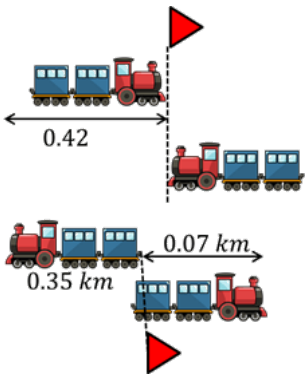
$$\Rightarrow \frac{s - \frac{20}{18}}{s - \frac{10}{18}} = \frac{9}{10}$$

$$s = \frac{110}{18}$$

$$l = 50m$$

Two Trains Are Heading Towards Each Other. The First Train Has a Speed of 60 Km/Hr. , the Second Has the Speed of 50 Km/H. The Length of the First Train is 0.35 Km, the Length of the Second Train is 0.42 Km. What is the Distance between the Point Where the Fronts of the Train Meet and the Point Where the Backs of Their Cars Meet?

There are two trains that travelling in opposite direction.



Relative distance $= 0.42 + 0.35 = \frac{0.77}{110} = \frac{7}{1000}$ hrs

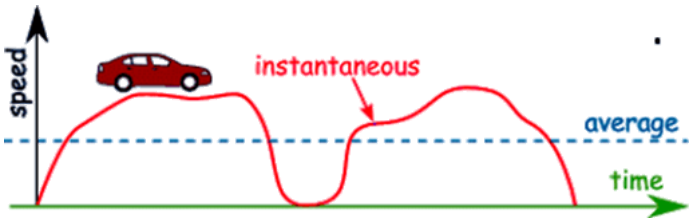
Distance between the front of train and back of the train: $\frac{7}{1000} \times 60$

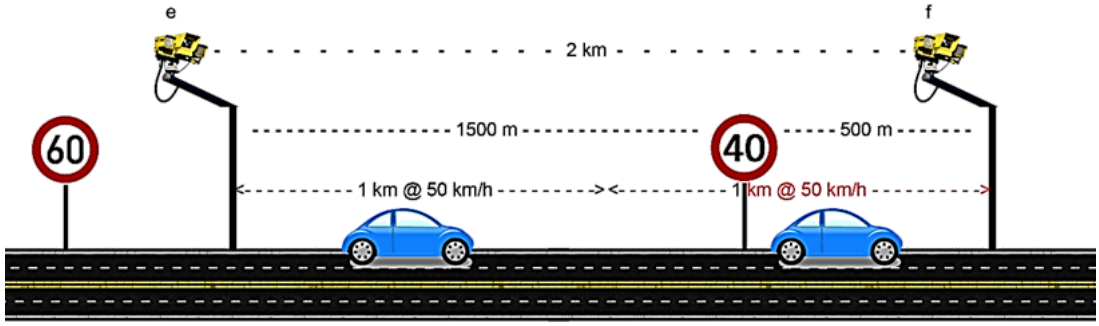
$= 0.42$ km

Distance $= 0.42 - 0.35 = 0.07$ km

Distance of 2nd flag $= 70$ km

Next: Average Speed





-Mayank

Developed by: Mindsprite Solutions