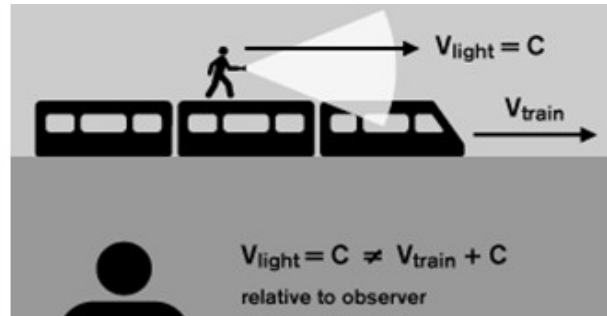
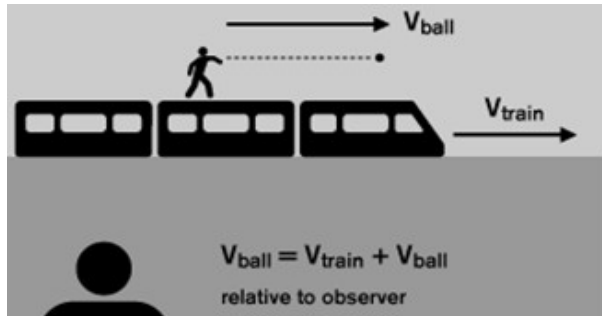


Special Relativity: Time Dilation and Length Contraction

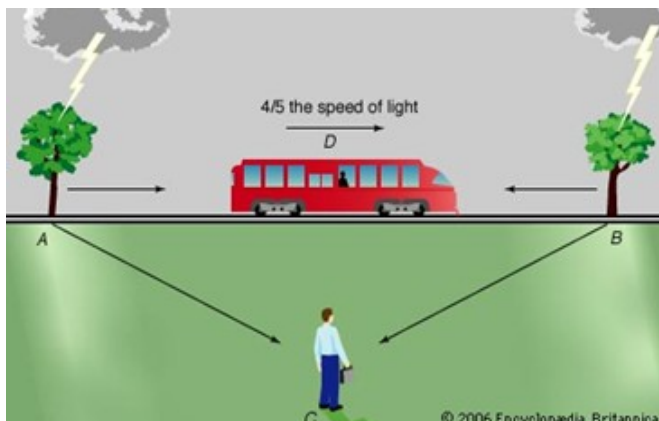
SPH4U

Einstein's Postulates:

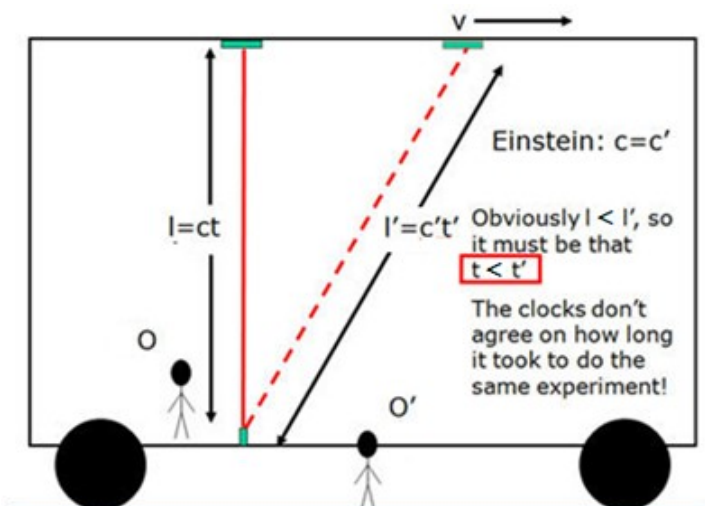
- All _____ of physics are _____ in all _____ (_____)
- Light travels at _____ relative to _____.



This implies that events that are _____ (occurring at the _____) for one observer are _____ simultaneous for an observer in a _____.



And that observers in different reference frames _____.



Time Dilation:

Diagram:

According to the Pythagorean Theorem:

The factor _____ is often written as _____:

Note that _____ is _____ (it has _____).

Similarly, it can be shown that lengths parallel to the direction of motion are contracted:

Example: Muons created in the upper atmosphere have a lifetime of $2.2 \mu\text{s}$ in their reference frame but reach the Earth's surface because they see the distance to the surface as contracted and/or we see the lifetime as dilated. What is the apparent lifetime of a muon travelling at $0.99c$?