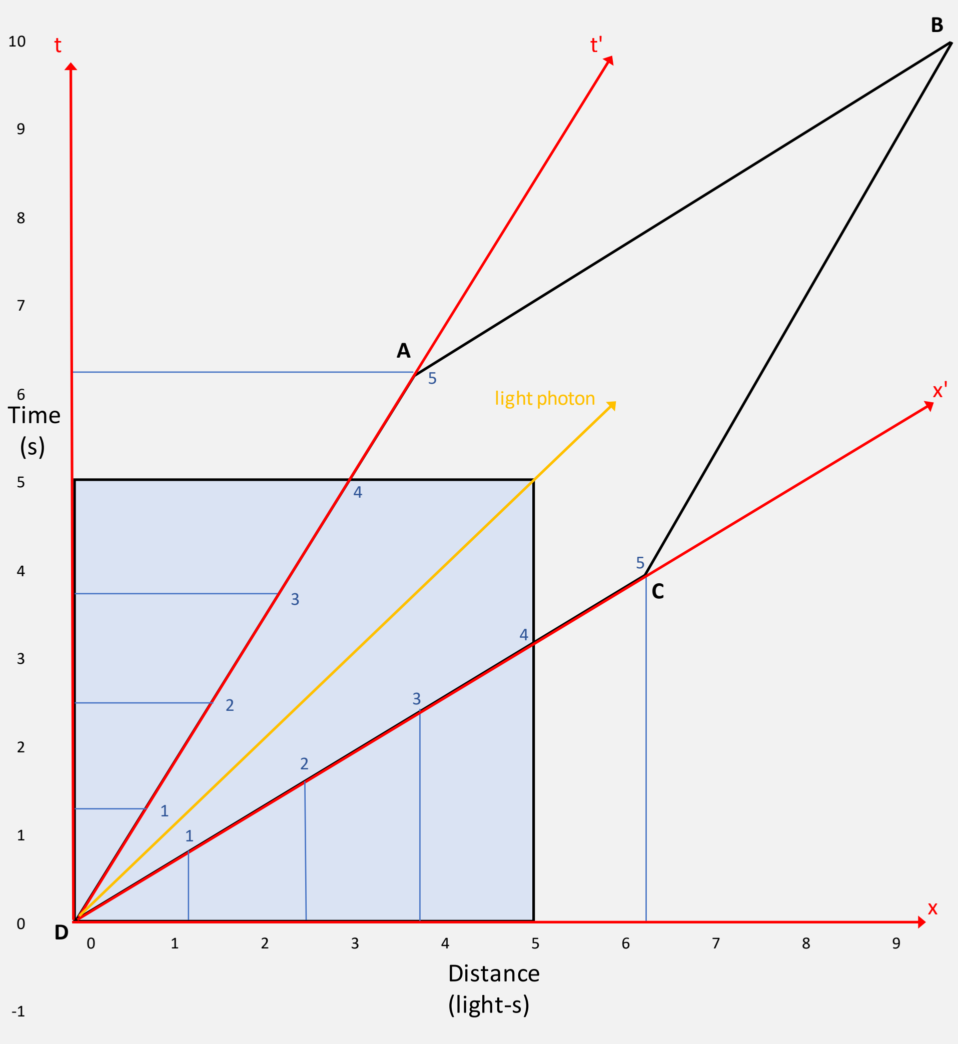

Depicted in the diagram are two different frames of reference that are in relative motion to one another.

The square shaded area is one frame, with the (x,t) coordinate system for distance and time. Call this the S frame.

The rhombus ABCD depicts another reference frame, moving at a constant velocity of 60% of the speed of light in the x direction relative to the S frame, with the (x',t') coordinate system for distance and time. Call this the S' frame.

For ease of presentation, units of measurement are seconds for time and light-seconds for distance (the distance light travels in a second, which is 3.0 x 10^8 metres), such that the spacetime line for a photon of light in the diagram, has a slope of 1. That is, light travels one light-second per second. Equally, the units could have been minutes and light-minutes, or years and light-years to depict a slope of 1 for the movement of light.

Note the slope of the t' axis = 1 / 0.6, reflective of the relative velocity of the S' frame of v = 0.6c, where c is the speed of light. As v approaches c, the slope of t' approaches 1, which is the photon of light path in the diagram. Conversely, as v approaches 0 (as it is in our day to day life, even at rocket speeds), then the slope of t' approaches infinity and is effectively the t-axis.

A 5 x 5 units square in the S frame is shown for illustrative purposes. What follows applies to the whole of the S' frame. The effect of the S' frame moving at 0.6c is significantly fast enough that it distorts time and space. It's frame, superimposed on the square, is a squeezed and stretched 5 x 5 square such that the diagonal sloping to the right grows and the other diagonal shrinks, thus forming a rhombus (ABCD), a shape of four equal sides.

With the spacetime area invariant (that is, the area of the rhombus equals the area of the square), the stretching and contracting of the rhombus diagonals are both by the same factor. At a relative speed of v = 0.6c, that factor is 2 (the large diagonal is twice the diagonal of the square, the small diagonal is half). As v approaches c, the large diagonal approaches infinity, and the small diagonal approaches zero.

Significantly, the diagram shows time dilation and length contraction occurring.

On the t-axis, t=6.25 maps to t'=5, t=5 maps to t'=4, t=3.75 to t'=3, and so on, when x'=0. Time shrinks by a factor of 0.8 in this situation. This factor is the square root of (1 - 0.6^2), 0.6 being the fraction of the speed of light that S' is moving relative to S. As v approaches c, the dilation factor approaches zero, and time in the S' frame is almost at a standstill.

Similarly on the x-axis, x=6.25 maps to x'=5, x=5 maps to x'=4, x=3.75 to x'=3, and so on, when t'=0. Space (or length) is also shrinking by a factor of 0.8.

Importantly, the speed of the photon of light is the same in both the S and S' frames at 1 light-s/s, verifying that the speed of light is invariant no matter the frame of reference, which underpins Einstein's Theory of Relativity.