The total distance travelled by the light pulse in the reference frame of a stationary observer is twice the length of one diagonal (d) (Figure 1.58) which is calculated using Pythagoras' theorem.

$$d = 2 \text{ x } \sqrt{L^2 + \left(\frac{vt}{2}\right)^2}$$

The time interval (t) between events A and B inside the spacecraft as measured in the reference frame of a stationary observer is determined using the formula derived below*.

t	$=$	$\frac{d}{c}$	t	$=$	$4L^2 + v^2t^2$
t	$=$	$\frac{2 \text{ x } \sqrt{L^2 + \left(\frac{vt}{2}\right)^2}}{c}$	$4L^2$	$=$	$c^2 \text{ x } t^2 - v^2t^2$
			$4L^2$	$=$	$(c^2 - v^2)\, t^2$
ct	$=$	$2 \text{ x } \sqrt{L^2 + \left(\frac{vt}{2}\right)^2}$	$\frac{4L^2}{c^2}$	$=$	$\left(\frac{c^2 - v^2}{c^2}\right) t^2$
c^2t^2	$=$	$2^2 \text{ x } L^2 + \left(\frac{vt}{2}\right)^2$	$\frac{4L^2}{c^2}$	$=$	$\left(\frac{c^2}{c^2} - \frac{v^2}{c^2}\right) t^2$
c^2t^2	$=$	$4L^2 + \left(\frac{v^2t^2}{4}\right)$	$\frac{4L^2}{c^2}$	$=$	$\left(1 - \frac{v^2}{c^2}\right) t^2$
c^2t^2	$=$	$\frac{4L^2}{1} + \left(\frac{v^2t^2}{4}\right)$	$\frac{2L}{c}$	$=$	$\sqrt{\left(1 - \frac{v^2}{c^2}\right)}\, t$
c^2t^2	$=$	$\frac{16L^2}{4} + \left(\frac{v^2t^2}{4}\right)$	t_0	$=$	$\sqrt{\left(1 - \frac{v^2}{c^2}\right)}\, t$
c^2t^2	$=$	$\frac{16L^2 + v^2t^2}{4}$	t	$=$	$\frac{1}{\sqrt{\left(1 - \frac{v^2}{c^2}\right)}} t_0$

The light clock example shows that the time interval between events A and B is different in two reference frames that are moving relative to each other. This phenomenon is called **time dilation**. The time interval (t) between events A and B measured in the reference frame of an observer on Earth is calculated using the formulae below.

Formulae	$t = \frac{1}{\sqrt{\left(1 - \frac{v^2}{c^2}\right)}} t_0$ and $t = \gamma t_0$

Symbol	Variable	SI unit
t	Time interval in the stationary observer's reference frame	s
t_0	Time interval in the moving reference frame	s
v	Relative velocity between the two reference frames.	m s^{-1}
c	Speed of light in a vacuum	m s^{-1}
γ	The Lorentz factor, $\frac{1}{\sqrt{\left(1 - \frac{v^2}{c^2}\right)}}$	

*This derivation is not assessed and has been included only for interest.