1. A quasar is a star which is rapidly spinning and which send out x-ray pulses periodically. Suppose a quasar is moving at a speed of 0.60c relative to the earth. In the quasar’s frame, it is sending a pulse every 1.5 seconds. In the earth’s frame, how often do we see the quasar emitting a pulse? Assume that the quasar is moving “sideways” to us, so we can ignore the Doppler effect.

\[
\Delta t = \Delta t_o / \sqrt{1 - v^2 / c^2} \quad L = L_o \sqrt{1 - v^2 / c^2} \quad c = 3 \times 10^8 \text{ m/s} \quad u = \frac{v + u'}{1 + \frac{vu'}{c^2}}
\]

\[
\Delta t = \frac{\Delta t_o}{\sqrt{1 - v^2 / c^2}} = \frac{1.5 \text{ s}}{\sqrt{1 - (0.60)^2}} = (1.5 \text{ s})/(0.80) = 1.88 \text{ s}
\]

2. Suppose you throw a frisbee at a speed of 0.80c to your friend, who wisely decides not to catch the disc. The frisbee is 10 inches in diameter in its own frame. As your friend watches the disc go by, what shape does he see, and what are the dimensions? Draw what he sees and include dimensions.

The frisbee is shortened in the direction of motion, but not in the other direction.

\[
L = L_o \sqrt{1 - v^2 / c^2} = (10 \text{ in}) \sqrt{1 - (0.80)^2} = 6.0 \text{ in}
\]