

9. Only the “component” of the length in the x direction contracts, so its y component stays

$$\ell'_y = \ell_y = \ell \sin 30^\circ = 0.5000 \text{ m}$$

while its x component becomes

$$\ell'_x = \ell_x \sqrt{1 - \beta^2} = \ell \cos 30^\circ \sqrt{1 - 0.90^2} = 0.3775 \text{ m} .$$

Therefore, using the Pythagorean theorem, the length measured from S' is

$$\ell' = \sqrt{(\ell'_x)^2 + (\ell'_y)^2} = 0.626 \text{ m} .$$