

UNIVERSITY OF SURREY

Department of Physics



Space, Time and Relativity

Tutorial Sheet 4

Problem on the Twins' Paradox

This supplementary problem will not be assessed but is intended to give you further practise in the use of the Lorentz Transformation equations to resolve the "twins' paradox" in Special Relativity.

As described in the lectures, twin B stays on Earth while twin A sets off in a rocket to a nearby star, 4 light-years away, at a speed of $v = 0.8c$. The paradox was found to be resolved using length contraction arguments (the distance covered by A is less, which is why less time elapses on board the rocket) but there was a problem with using time dilation arguments due to twin A changing from one reference frame to another.

Consider yourself as an independent adjudicator who is travelling in another rocket towards Earth for the duration of A's there-and-back journey. Since you remain in the same inertial frame throughout, your calculations can be trusted. Use the Lorentz Transformation equations to analyse the time elapsed on board A's rocket and on Earth.

J.S. Al-Khalili
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