

answer to YBM's bell problem

Source: <http://sci.tech-archive.net/Archive/sci.physics.relativity/2008-09/msg00578.html>

- *From:* rbwinn <rbwinn3@xxxxxxxxx>
 - *Date:* Tue, 9 Sep 2008 07:21:20 -0700 (PDT)
-

YBM proposed the following problem. Taking the Galilean transformation equations and no length contraction with frame of reference B moving in the +x direction relative to frame of reference A, light is emitted at a distance of a either side of the origins of A and B when they coincide. YBM says there is a bell at the origins that will ring when light from both sources hits it. Since he did not specify whether the bell was at the origin of A or the origin of B, we will work the problem with the bell at the origin of A. In A, the light is emitted at $x=a$ and $x=-a$. In B the light is emitted at $x'=a$ and $x'=-a$. Light emitted at $-a$ has a velocity of c relative to both frames of reference. Light emitted at a has a velocity of $-c$ relative to both frames of reference. If the bell is at the origin of A, it will ring when $t=a/c$.

The mathematics for this is, for the light from $-a$, $x_1=-a$, $x_2=0$
 $x_2-x_1 = 0-(-a) = a$
 $x=wt=ct = a$
 $t=a/c$

For the light from a , $x_1=a$, $x_2=0$ $w=(-c)$
 $x_2-x_1 = 0 - a$
 $x=wt=(-c)t = -a$
 $t=a/c$

Light from both directions reaches the bell at a time of a/c , and the bell rings.

To determine what time a clock in B reads when the bell rings,

$$n' = t(1-v/w)$$
$$n' = a/c(1-v/c)$$

Robert B. Winn

.