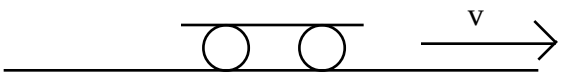
SPECIAL RELATIVITY Q1.0

$\gamma = \dfrac{1}{\sqrt{1-\dfrac{v^2}{c^2}}} \geq 1$ $\quad c = 3\times10^8 \ {}^{m}\!/_{s}$ $\quad \Delta t = \gamma \Delta t'$ $\quad \ell = \dfrac{\ell'}{\gamma}$ where $\Delta t'$ and ℓ' are proper time and length

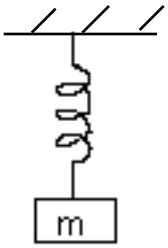
v	γ
.1c	1.01
.2c	1.02
.3c	1.05
.5c	1.15
.8c	1.67
.9c	2.29
.99c	7.09
.995c	10.0
.999c	22.4

1. Albert is standing along a straight road when a cart rolls by at a relativistic speed of .5c. He remembers measuring the length of the cart at 6m when it was at rest along the road. How long is the moving cart as measured by Albert now?

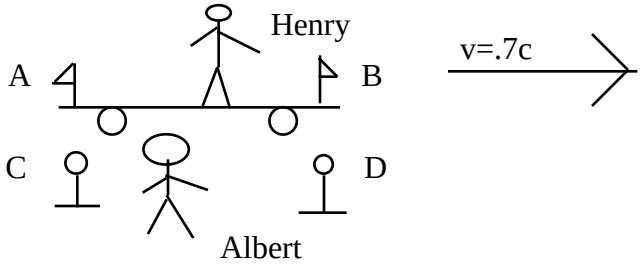


2. Show your work and determine gamma when the cart is moving at a speed of .6c with respect to the earth.

3. A spaceship watches some physics students measuring the period of an oscillating spring-mass system. The students measure the period to be 1.4 sec. The spaceship is traveling past the earth at 99% the speed of light. What is the period of one up-down cycle according to the measurements in the aliens' spaceship?



4. Henry is riding on a cart traveling at .7c when a light flashes at the middle of his cart. The cart is moving to the right according to Albert. When the light reaches the two ends of his cart, light sensors go off and sound "ding". Albert is on the ground and has two light sensors ready to go off and sound "bang". They are also equidistant from the light flash. List the light sensors in the order in which they sound.



5. A rocket travels away from the earth at .9c and the astronaut in the rocket ages 2 hours according to his watch. How much does the scientist on the earth age according to the scientist's watch?