Virtual Clicker

https://pollev.com/dannycaballe980

Notes for today

http://dannycaballero.info/phy482msu_s2020/notes/31-slides.html

CHANGES TO SYLLABUS

- Pair project is cancelled. One additional homework problem per week.
- Homework: 40% -> 50%
- Individual Project: 20% -> 25%
- Quizzes: 20% -> 25%

Will still drop one homework assignment and quiz.

I will take into account the wildly-extenuated circumstances when assigning letter grades.

DEMO

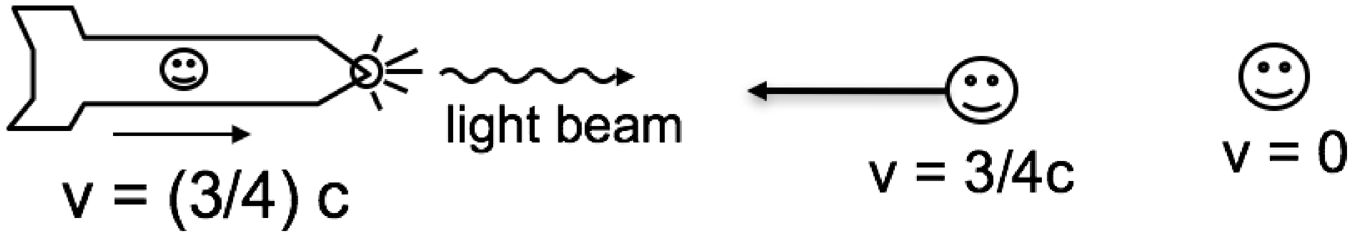
Galilean relativity example courtesy of Jamiroquai

Standing on a moving walkway in the airport that is moving at 1 m/s to the right, you toss a ball into the air. You observe the ball moving straight up and down.

I'm sitting on a bench watching your shenanigans. What do I have to do to make my physics match yours? That is, what do I have to do to reproduce all your measurements?

A. Add 1 m/s to the left
B. Add 1 m/s to the right
C. Subtract 1 m/s to the right
D. Subtract 1 m/s to the left
E. None or more than one of these

A rocket is moving to the right at speed $v = (3/4)c$, relative to Earth. On the front of the rocket is a headlight which emits a flash of light.



In the reference frame of a passenger on the rocket, the speed of the light flash is

A. c
B. 7/4 c
C. 1/4 c
D. None of these

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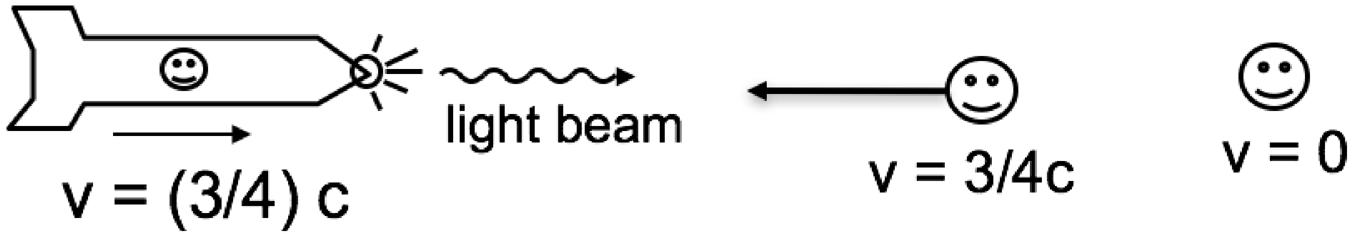

According to a person at rest on the earth, the speed of the light flash is

A. c
B. 7/4 c
C. 1/4 c
D. None of these

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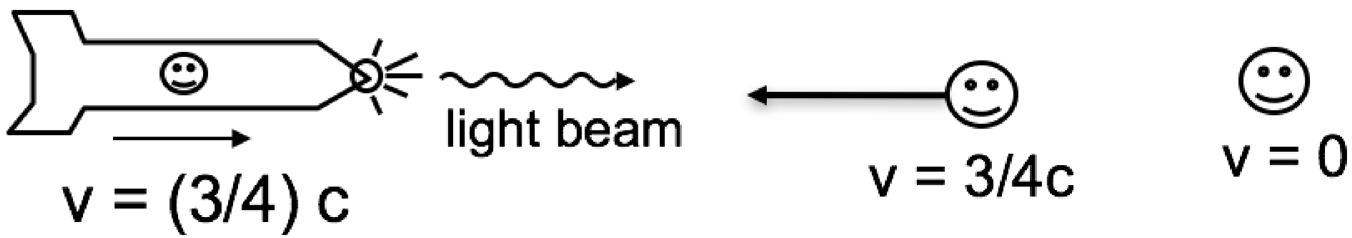

According to a person moving toward the rocket at speed $(3/4)c$, relative to earth, the speed of the light flash is

A. c
B. 7/4 c
C. 1/4 c
D. None of these

Consider a S' frame moving with a speed v in 1D with respect to a stationary frame S. Using your everyday intuition, write down the relationship between a position measurement x and x'.

Be ready to explain why this makes sense to you.

The Galilean transformation between S' and S is:

$$x = x' + vt$$

The Lorentz transformation will introduce a γ, where do you think it goes? And why?

I'm in frame S, and you are in is in Frame S', which moves with speed V in the $+x$ direction.

An object moves in the S' frame in the $+x$ direction with speed v_x'. Do I measure its x component of velocity to be $v_x = v_x'$?

A. Yes

B. No

C. ???

I'm in frame S, and you are in is in Frame S', which moves with speed V in the $+x$ direction.

An object moves in the S' frame in the $+y$ direction with speed v'_y. Do I measure its y component of velocity to be $v_y = v'_y$?

A. Yes
B. No
C. ???

With Einstein's velocity addition rule,

$$u = \frac{u' + v}{1 + \frac{u'v}{c^2}}$$

what happens when v is very small compared to c?

A. $u \rightarrow 0$
B. $u \rightarrow c$
C. $u \rightarrow \infty$
D. $u \approx u' + v$
E. Something else

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$$u = \frac{u' + v}{1 + \frac{u'v}{c^2}}$$

what happens when u' is c?

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With Einstein's velocity addition rule,

$$u = \frac{u' + v}{1 + \frac{u'v}{c^2}}$$

what happens when v is c?

A. $u \to 0$

B. $u \to c$

C. $u \to \infty$

D. $u \approx u' + v$

E. Something else