

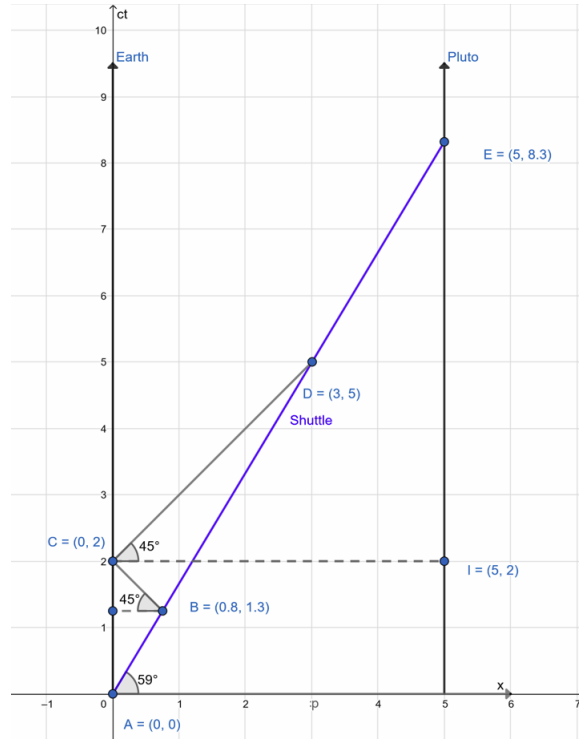
# PEU 453 Assignment 2

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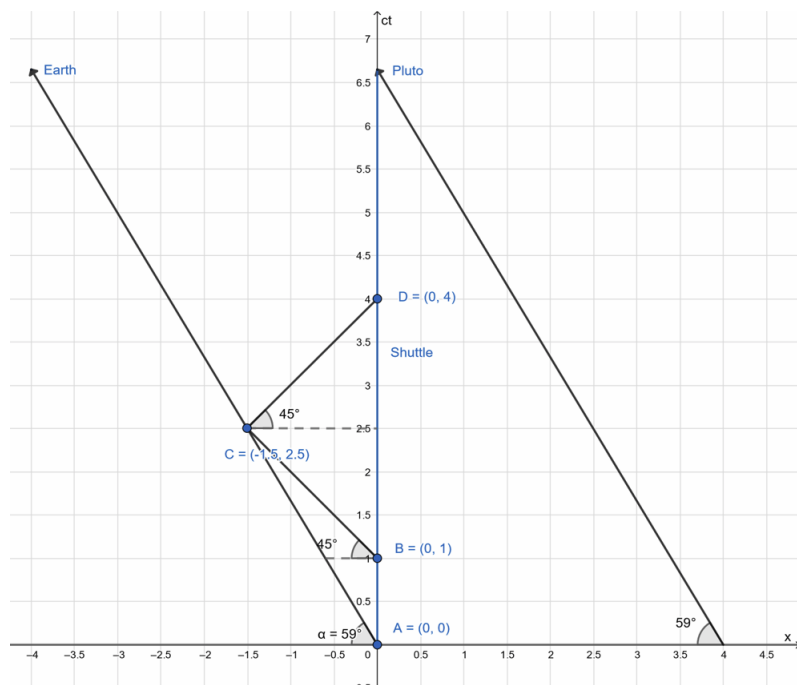
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# 1 Problem 2.4



- The boss expects to have the message arrive at  $2 T_m$  however as he is traveling  $0.6c$  it should arrive after  $\Delta t' = \gamma \Delta t = 1 T_m \frac{1}{\sqrt{1-0.6^2}} = 1.25 T_m$  which is  $2.5 T_m$  in proper time from the start of the journey. It arrives at approximately 5.
- The light message takes time to travel and the distance it requires to travel means that it needs to spend more time than the nap duration.
- is the  $T_B = 1.25 T_m$ ,  $T_D = 5 T_m$ ,  $\Delta t = T_D - T_B = 3.75 T_m$ ,  $\Delta T' = \frac{\Delta T}{\gamma} = 0.8 * 3.75 T_m = 3 T_m$
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## 2 Problem 2.6

- a. Since the both events happen at the same location in the station frame  
 $\Delta T' = \frac{\Delta T}{\gamma} = \sqrt{1 - \beta^2} 100 = 80m$
- b. They are equal since the the event A and B mark the beginning and the end of the train touching the train station.

### 3 Problem 2.9

a. For A:

$$v = \frac{d}{t} = \frac{6}{13} \quad \Delta T' = \frac{\Delta T}{\gamma} = 13Tm\sqrt{1 - \frac{36}{169}} = \sqrt{133} \approx 11.5$$

b. For B:

$$v = \frac{d}{t} = \frac{3\pi}{13} \quad \Delta T' = 13Tm\sqrt{1 - \frac{3\pi^2}{13}} = \sqrt{133} \approx 9$$

## 4 Problem 2.10

$$L - vt_1 = ct_1 \implies t_1 = \frac{L}{c + v}$$

$$L + vt_2 = ct_2 \implies t_2 = \frac{L}{c - v}$$

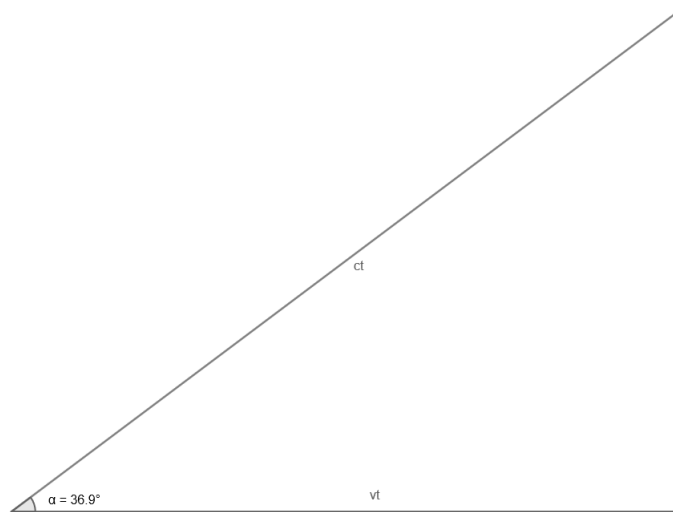
$$t = t_1 + t_2 = \frac{L}{c + v} + \frac{L}{c - v} = \frac{2L}{c} \frac{1}{1 - \left(\frac{v}{c}\right)^2} = \frac{2L}{c} \gamma^2$$

$$t' = \frac{2L'}{c}$$

Where  $L' = L\gamma$  &  $\gamma = \frac{1}{\sqrt{1 - \left(\frac{v}{c}\right)^2}}$

$$t = t'\gamma$$

## 5 Problem 2.11



$$\theta = \cos^{-1}\left(\frac{4}{5}\right) = 36.87$$

## References

- [1] M.H. El-Deeb. [PEU-453 Assignments](#).