

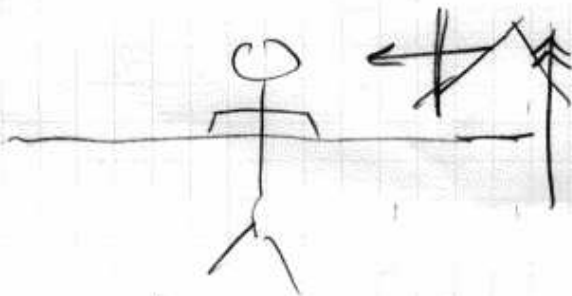
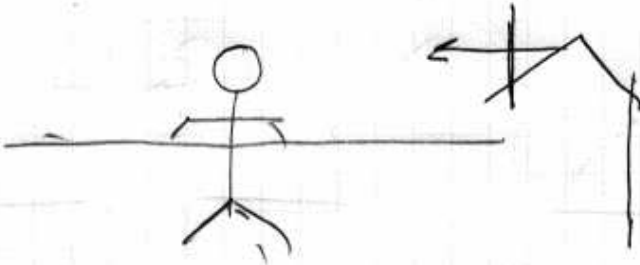
1

(a) BARRED FRAME: VAULTED

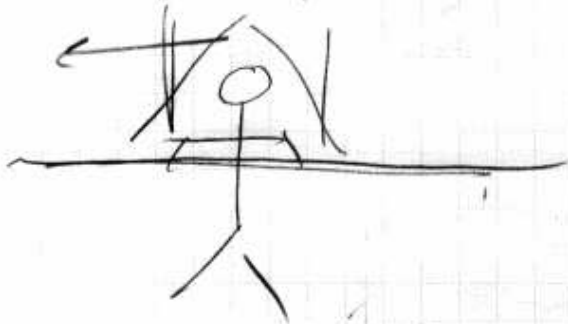
$$l = \frac{\bar{l}}{\gamma} \quad \text{SHORTER IN OUR FRAME}$$

$$= \sqrt{1 - (0.8)^2} (10\text{m}) = \sqrt{0.36} (10\text{m}) = \underline{\underline{6\text{m}}} \quad \checkmark$$

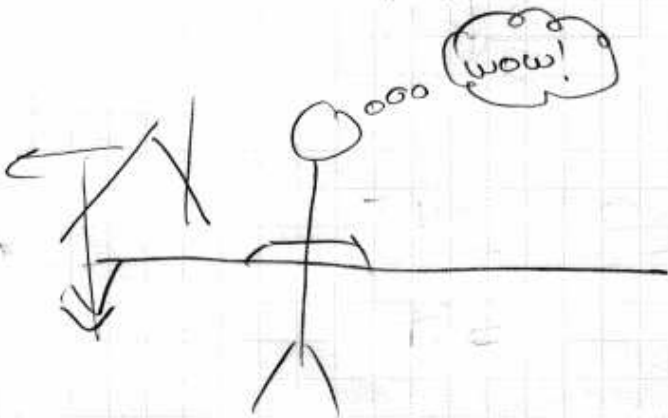
(b) SIMULTANEITY! WHAT HAPPENS IS:



RIGHT DOOR OPENS



BOTH DOORS  
OPEN FOR  
A WHILE



LEFT DOOR,  
CLOSES

⇒ THE LEFT DOOR IS THE  
LEADING CLOCK, AND  
IS BEHIND!

1 c

SIMULTANEITY: FRONT + BACK CLOCKS  
SYNCH'D IN GARAGE  
FRAME.

IN P.V. FRAME, FRONT  
CLOCK IS

$$\gamma v L$$

↑  
GARAGE REST LENGTH

BEHIND

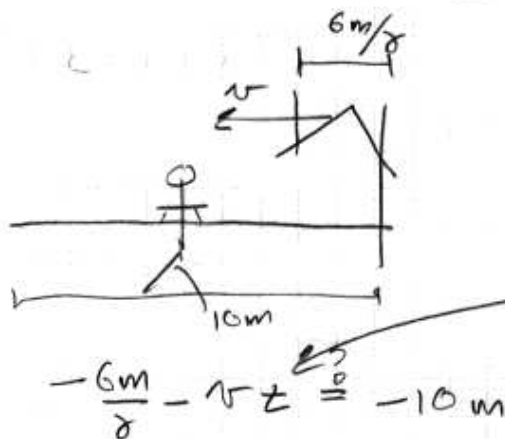
$$= \frac{(0.8)(6m)}{\sqrt{1-(0.8)^2}} = 8m$$

↑↑  
THIS IS A  
TIME!

$$c = 1 = 3 \times 10^8 \frac{m}{s}$$

$$(\text{8m OF TIME}) \left( \frac{1s}{3 \times 10^8 m} \right) = 2.7 \times 10^{-8} \text{ SEC}$$

- FRONT OF POLE REACHES RIGHT DOOR
- BACK DOOR HAD BETTER REACH BACK  
OF POLE  $2.7 \times 10^{-8}$  SEC LATER



$$\left( \frac{-6m}{\gamma} \right) - (0.8)(8m)$$

$$= \sqrt{1-(0.8)^2} 6m - 6.4m$$

$$= -(0.6)(6m) - 6.4m = -3.6m - 6.4m = -10m \checkmark$$

EQ. OF MOTION  
FOR LEFT DOOR  
 $t = 2.7 \times 10^{-8} s$   
 $= 8m$   
 $v = 0.8$

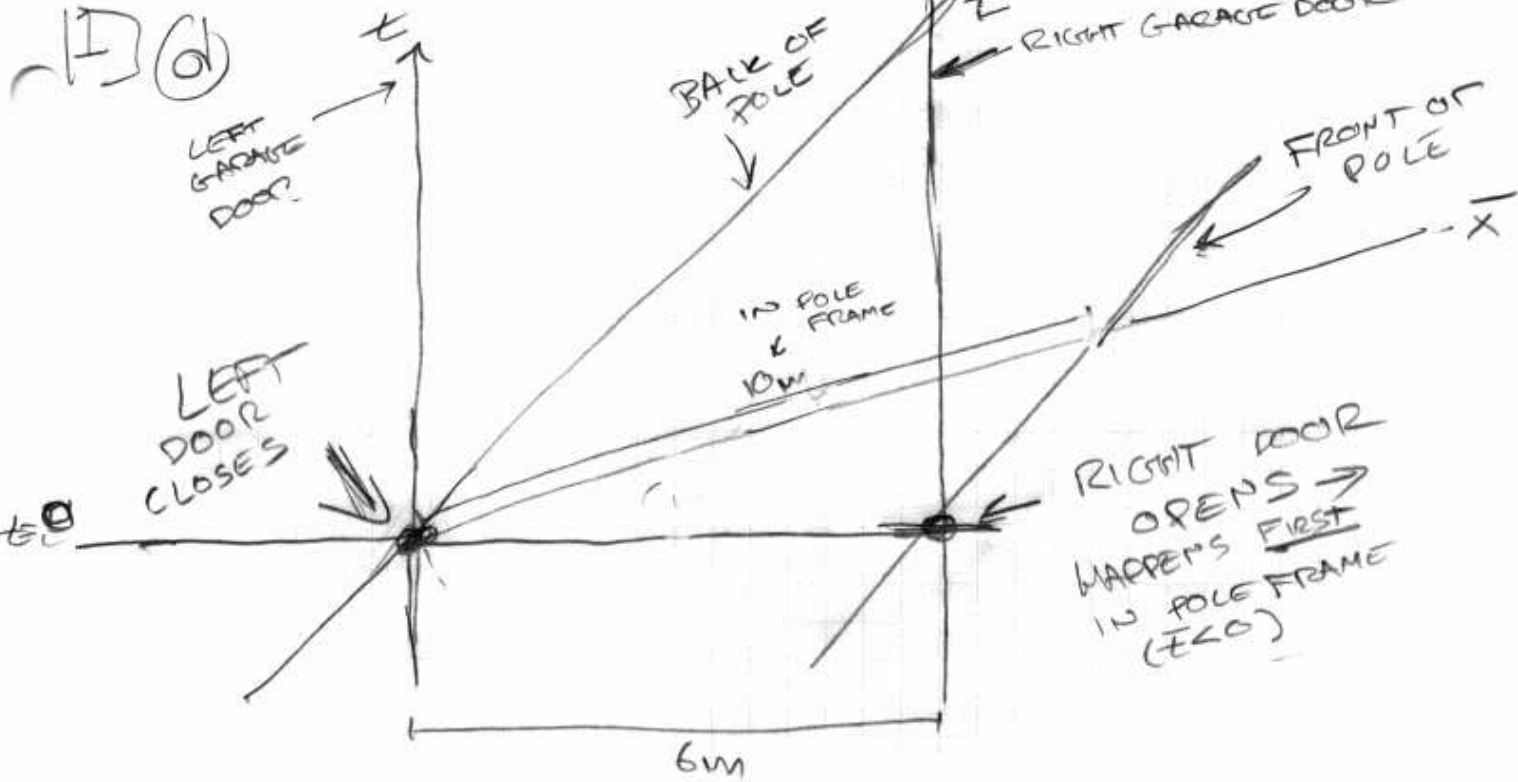
A260

GROUP PROBS

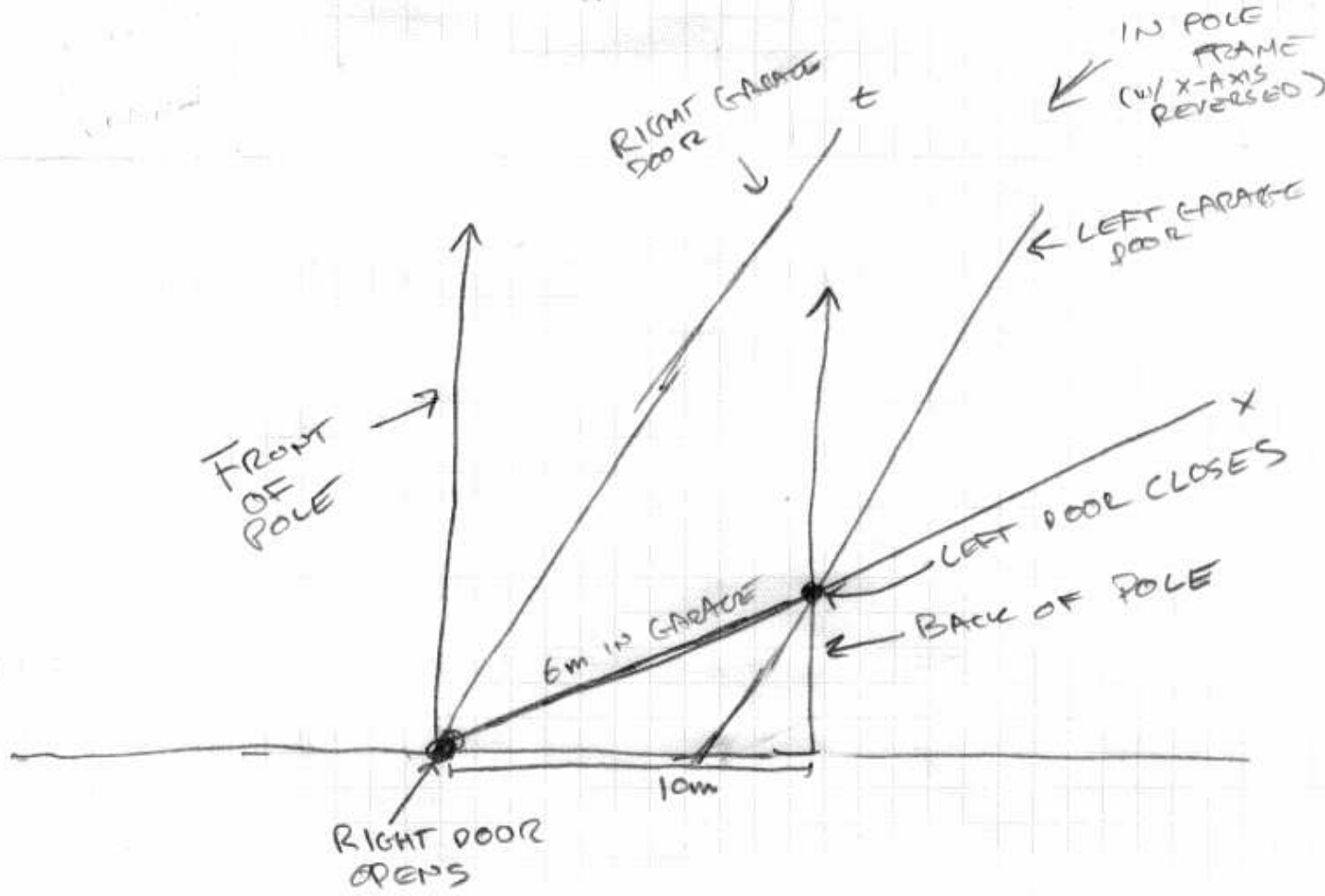
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(3)

(I) (d)



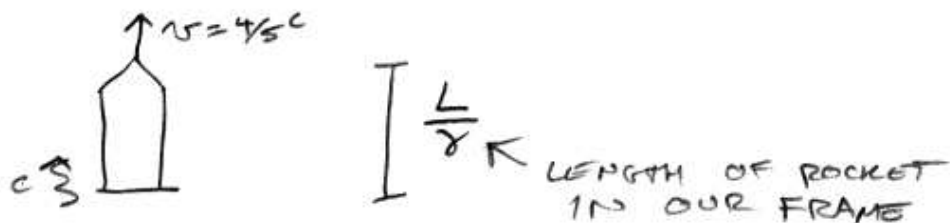
IN OUR FRAME



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LET'S DO EARTH FRAME FIRST

6



FOR SIGNAL TO REACH NOSE

$$c t = \frac{L}{\gamma} + \frac{4}{5} c t$$

$$t = \frac{L}{\gamma} + 0.8 t$$

$$\frac{1}{\gamma} = \sqrt{1 - 0.8^2}$$

$$\frac{1}{\gamma} = 0.6$$

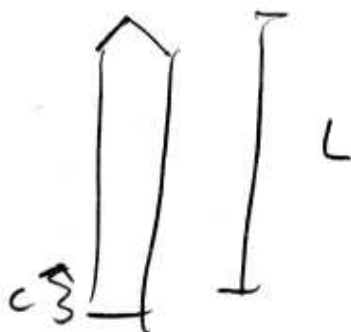
$$0.2 t = 0.6 L$$

$$\underline{t = 3L}$$

IN EARTH FRAME

$$\left( \frac{3L}{c} \text{ IF YOU WILL} \right)$$

7 THIS IS EASY! LIGHT MUST GO DIST L



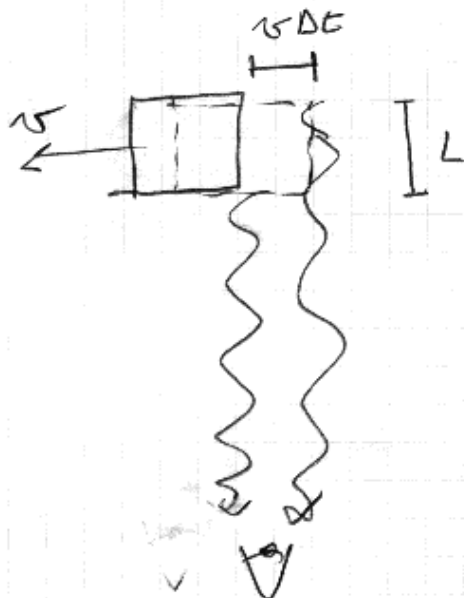
$$\underline{t = L}$$

IN ROCKET FRAME

THINK: WHY DON'T WE HAVE

$$t_{\text{ROCKET}} = \gamma t_{\text{EARTH}} ???$$

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PHOTON FROM FRONT &  
BACK OF CUBE ARRIVES  
AT THE SAME TIME;

BACK PHOTON TAKES LONGER

$$\text{BY } \Delta t = L \quad \left( \Delta t = \frac{L}{c} \right)$$



$$\tan \theta = \frac{v\Delta t}{L} = \underline{\underline{v = \tan \theta}}$$

THINK:  $v=0$ ,  
 $\theta=0$   
(WHEW!)