

Frames of Reference

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- 1) What did you see that reinforced something about the physical world you might already be familiar with from your everyday experience?

- 2) What did you see that surprised you about the physical world?

- 3) What did you see that connected with work we've previously done (or that you've done in a previous class)?

- 4) What did you see that connected with today's Einstein reading?

- 5) Did you see anything that helped you understand a question you had from today's Einstein reading (or reminded you of a question you have from today's reading)?

- 6) What parts of the film did you find less interesting, and why?

- 7) What parts of the film did you find most interesting, and why?

- 8) Were you struck by any 'theatrical' moments in the film?

- 9) What did you see that you now have questions about that you might not have had before (or that you had before but continue to have)?

- 10) How many people were shown in the film?

Learning Goals for Special Relativity

- 1) Relate, convert between, and use powers of 10, scientific notation, and appropriate prefixes.
- 2) Convert distance, time, or speed in one set of units into a different set of units, including relativistic units.
- 3) Develop an intuitive feel for speeds, connecting numerical values to motion in the world.
- 4) Use the Pythagorean theorem to determine the distance between two points or the lengths of objects and paths.
- 5) In constant speed situations, given any two of distance, speed, or time, determine the third.
- 6) Use, transform between, and create a) tables of data, b) motion diagrams, c) position vs. time diagrams, and d) space-time diagrams to represent constant speed motion.
- 7) Relate the speeds of objects or of reference frames using the velocity transformations.
- 8) State the basic, fundamental principles of relativity, and explain how the various aspects of relativity all follow logically from these basic principles.
- 9) Relate time intervals in two different reference frames using the proper time relation if one of the observers is at both events.
- 10) Relate length and distance measurements in two different reference frames using the length contraction relation if one of the observers is at rest with respect to the distance/length being measured.
- 11) Calculate a spacetime interval between two events, classify the interval as space-like, time-like or light-like, and determine whether or not the two events are causally linked.
- 12) Use the invariance of the interval to relate distance and time intervals in one reference frame to those in a different frame.
- 13) Draw and/or interpret a spacetime diagram, and use this diagram to determine time- and spatial-ordering of events, including whether or not events are simultaneous or at the same location in particular reference frames.