OBSERVING AND DESCRIBING MOTION

Problem: Use frame of reference to describe motion.

Background Information: (Describe what you know about the problem, content, vocabulary, materials used, and procedure.)

Materials: Stop watch

 Meter stick

 Tape, string or other marking item

Procedure:

 Work in a group of five:

 1. Prepare a clear track 1 meter wide and 5 meters long. Mark a starting line

 and a finish line.

2. One group member will be in motion, walking backwards from the starting

 line to the finish line.

 The other group members will observe and measure the time and distance of the motion:

 One group member will stand behind the starting line to observe and time the walker

One group member will stand at the finish line to observe and time the walker

One group member will stand at the left sideline to observe and time the walker

 One group member will stand at the right sideline to observe and time

 the mover.

3. Each observer should start his or her stopwatch when the walker starts moving and stop when the walker reaches the finish line. The walking group member should record the times from each observer.

 4. Repeat step 3 for a total of three trials. Record the time of the motion.

 5. After all three trials, each observing group member should draw a diagram

 in the appropriate box and briefly describe in words, the motion of the

 walker from their own frame of reference (f.o.r).

 6. Rotate positions. The walker becomes an observer and each observer moves to a different position.

7. Repeat steps three, four, five and six until each group member has been a walker and has been at each observing position (frame of reference).

Analysis:

1. Why did each walker do three trials?

2. Calculate the average time of motion for each frame of reference position.

 Starting line \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Finish Line \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Left sideline \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Right sideline \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. Why do we average data?

4. Look at the average times you calculated. Is there a significant difference in the average times from the different frame of reference positions?

 yes no

5. Should there be a difference in average times from the different positions?

 yes no

6. Explain your answer to question 5.

7. If there is a significant difference in the average times, what might be the cause?

8. After examining your data, do you think frame of reference has an affect on the

 time of motion? Explain.

9. What are some possible sources of error for this activity?

10. Examine the drawings and descriptions you made for the different frames of reference. Then, look at your group members’ drawings.

 a. How are the drawings and descriptions alike?

 b. How are the drawings and descriptions different?

11. Think about what you have learned about motion and frame of reference:

 How we recognize frame of reference,

 Things that do and do not affect frame of reference,

 Things that frame of reference does and does not affect.

 Remember the terms position, distance, displacement

 Then, in your own words, write a few sentences describing and defining frame of reference, as they might appear in Wikipedia or another encyclopedia. It may be helpful to include diagrams in your discussion.

12. Describe how this activity about frame of reference relates to an experience you have had in the real world.