Frames of Reference

Have you ever experienced the sensation of not knowing whether you are moving or stationary while seated in a vehicle such as a train or airplane? Almost everyone has had this kind of an experience when the view to the outside world is restricted in such a way that visual background clues are minimized. This phenomenon is particularly noticeable while looking through small "porthole" style airplane windows that provide a very restricted view of the outside world. If one observes an nearby plane "moving" it sometimes is difficult to determine whether that plane is actually moving or whether the plane you are seated in is moving. In this case, you need a stationary object (such as the terminal building) against which to make a visual assessment of movement.

The point is that motion is relative and the entire concept of motion is very subtle because it depends on the chosen **frame of reference**. It is useful to pursue this a bit more with some additional examples. Let's assume you are in a lifeboat with no oars and no engine in the middle of an ocean (a terrible predicament for sure) and another boat comes into view. Without any navigation aids, how do you determine your motion relative to the other boat? Is your boat stationary? Is the other boat is moving? Or is the other boat stationary and your boat moving? Or are both boats moving simultaneously? If you define yourself as the observer, you might decide that you are motionless and the other boat is moving as it comes into view. On the other hand, if the people on the other boat are the observers, they might decide that they are motionless and your boat is moving toward them. Motion is relative and it is necessary to define "relative to what."

Let's consider one more example. Assume you are in the batter's box and a pitcher throws a 90 mph fastball in your direction. Could you describe the motion of the ball from all three perspectives – the pitcher, the batter, and the baseball being thrown? As the batter, you decide that the ball is clearly in motion relative to your position at the plate. But what would happen if the baseball were the "observer"? Wouldn't the baseball regard itself as stationary and decide that you and the bat were hurtling toward it at 90 mph? It all depends on the **frame of reference**.

Now you will show your understanding of this concept by doing a project!

Name: _____ Period: _____ Date: _____

RAFT Relative Motion Project

Instructions: In this activity, you will have an opportunity to demonstrate your understanding of the reading "Frames of Reference" by describing relative motion from different perspectives. You will produce a one-page written composition according to the RAFT guidelines:

R is for Role: *What is the role of the writer?*
A is for Audience: *Who will be reading this writing?*
F is for Format: *What is the best way to present this writing?*
T is for Topic: *Who or what is the subject of this writing?*

You will use the RAFT strategy to describe the motion of an object from some unusual perspectives. This writing assignment will then be used by your teacher to determine how well you understand relative motion as described in the "Frame of References" student reading.

The topic for this writing assignment must focus on describing the relative motion of an object within a local frame of reference; however, you have the freedom to choose one of the six projects following the Role, Audience, and Format for each project.

Role	Audience	Format	Topic
Airline passenger seated by a window looking at another moving plane in the adjacent gate Perspectives: 1. The airline passenger 2. An airline worker on the tarmac/runway 3. A second passenger in the adjacent plane	A person who has never flown in an airplane before.	A letter	Describe the relative motion of an object within a local from of reference. Describe motion from different perspectives as describe in the "Role."
Baseball - recently pitched Perspectives: 1. Pitcher 2. Baseball 3. Batter	A person listening to a baseball game on the radio	Radio sports commentary	Describe the relative motion of an object within a local from of reference. Describe motion from different perspectives as describe in the "Role."

Rain drop Perspectives: 1. Rain drop 2. Puddle 3. (add a 3rd perspective of your choosing)	A child playing in the rain	Post cards (one from each perspective)	Describe the relative motion of an object within a local from of reference. Describe motion from different perspectives as describe in the "Role."
Hockey Puck Perspectives: 1. Puck 2. Fan in the Bleachers 3. Goal Tender	A person reading about the hockey game.	Introduction to a newspaper sports column	Describe the relative motion of an object within a local from of reference. Describe motion from different perspectives as describe in the "Role."
Skateboarder on a cruise ship Perspectives: 1. A person on the shore 2. A crowd of onlookers on the ship 3. The skateboarder	Potential Travelers	Travel Brochure	Describe the relative motion of an object within a local from of reference. Describe motion from different perspectives as describe in the "Role."
Actor "driving" a stationary car surrounded by "moving" scenery in a movie Perspectives: 1. Actor in the car 2. Movie audience 3. The Director	A person that wants to see this movie	Film review	Describe the relative motion of an object within a local from of reference. Describe motion from different perspectives as describe in the "Role."

Select a Role, Audience, and Format as the basis for this RAFT writing assignment. All perspectives for your chosen Role must be completed.

Consider the following prompts as you approach the topic of relative motion: Describe the motion from each perspective. *What moves? What does not move? What appears to move? What appears not to move? What do you need to see (reference points in the background) to verify motion.*

Write to the audience using the suggested format. If you have an alternative Role, Audience, and/or Format you wish to use, please discuss this with your teacher to make sure it fits the guidelines for this project.

Relative Motion RAFT Rubric

Criteria	In Progress (0 - 3 points)	Meets Expectations (4 - 7 points)	Exceeds Expectations (8 - 10 points)
Understanding of Content	Describes the motion from only one perspective. Missing and/or misinterpreted information. Does not describe the local frame of reference.	Defines the local frame of reference. Describes motion from two different perspectives: the writer's role and the audience's frame of reference. Information presented reveals an understanding that motion is relative.	Describes motion from three or more different perspectives. Information presented reveals a sophisticated understanding that motion is relative.
Organization of Ideas	Ideas are disconnected and lack transitions. Attempts to write using a particular format, but may be missing format features or includes information that detracts from the purpose of the assignment.	Ideas flow; incorporates transitions when presenting different perspectives. Uses format effectively to write for a specific purpose.	Ideas flow smoothly; incorporates transitions when presenting different perspectives. Uses format effectively and creatively to write for a specific purpose.
Communication of Ideas	Ideas are vague because writing lacks descriptive details and precision. Writing does not show an awareness of audience.	Ideas are interesting because writing contains precise descriptions and details. Writing shows an awareness of audience.	Ideas are compelling and engaging because writing contains vivid, creative descriptions and sensory details. Writing reflects a keen awareness of audience.
Points per Category:	_____	_____	_____

Total Points:_____/30