Galilean Transformations

Physics II: Modern Physics

College of the Atlantic

1. Anastasia is standing next to a train track, and a train carrying Beowulf passes her at a speed of 50 m/s. Eight seconds later, a firecracker explodes 1000 m away from where Ana is standing, in the direction of the train tracks. Find the spacetime coordinates of the event in both Ana's and Beowulf's reference frames. Assume for this problem others that the train's direction coincides with the x-axis and that Ana's and Beowulf's clock are synchronized, both reading $t = 0$ exactly when Beowulf passes Ana. (Suggestions: Draw a picture. Write out your steps, even if you can do the arithmetic in your head.

2. Anastasia is standing next to a train track, and a train carrying Beowulf passes her at a speed of β. At a time t later, a firecracker explodes a distance x away from where Ana is standing, in the direction of the train tracks. Determine a formula for the spacetime coordinates (x' and t') in Beowulf's reference frame. Your answer will be a formula involving x, t, and β.

3. Anastasia is standing next to a train track and a train carrying Beowulf passes her at a speed of 100 m/s. Ten seconds later a firecracker explodes 500m from where Ana is standing, in the direction of the train tracks. Find the spacetime coordinates of this event in both Ana's and Beowulf's reference frames.

4. Anastasia is standing next to a train track and a train carrying Beowulf passes her at a speed of 50 m/s. Ten seconds later a firecracker explodes 500m from where Ana is standing, in the direction of the train tracks. Find the spacetime coordinates of this event in both Ana's and Beowulf's reference frames.