

**HOMEWORK - RELATIVE MOTION - DAY #1**

Name: \_\_\_\_\_

Period: \_\_\_\_\_ Date: \_\_\_\_\_

1.)

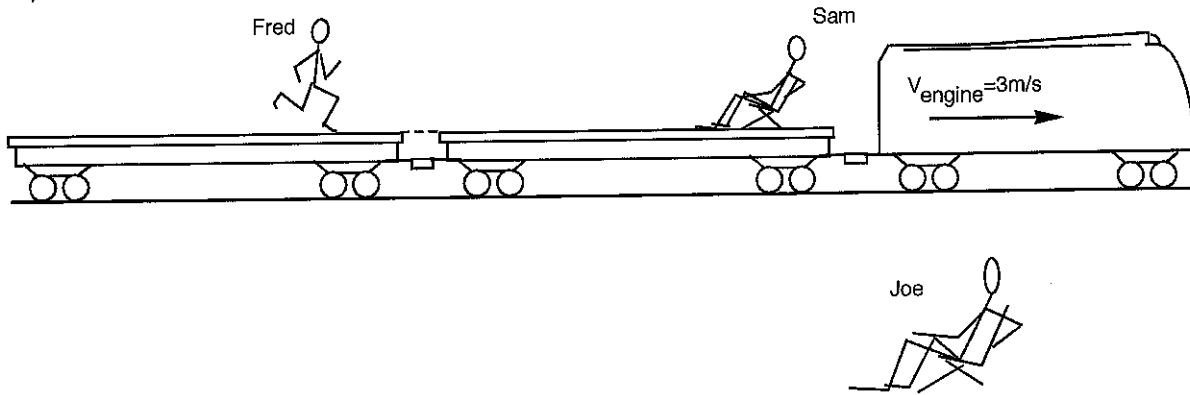


Figure 2.22

A long train of flat cars is traveling East at a steady speed of three m/sec. Fred is running at his standard rate of five m/sec on the flat cars toward the front of the train. Sam is watching from his chair on the flat car.

Answer the following questions including units and directions on vector quantities.

a.) During a 10 second period how much closer does Fred get to Sam?

b.) With what velocity does Sam see Fred approaching? \_\_\_\_\_  
\_\_\_\_\_

c.) Find Fred's displacement during the ten second period as seen by Joe.  
\_\_\_\_\_

d.) With what velocity does Sam see Fred approaching?  
\_\_\_\_\_

e.) What is Fred's velocity as seen from Joe's point of view?  
\_\_\_\_\_

2.)

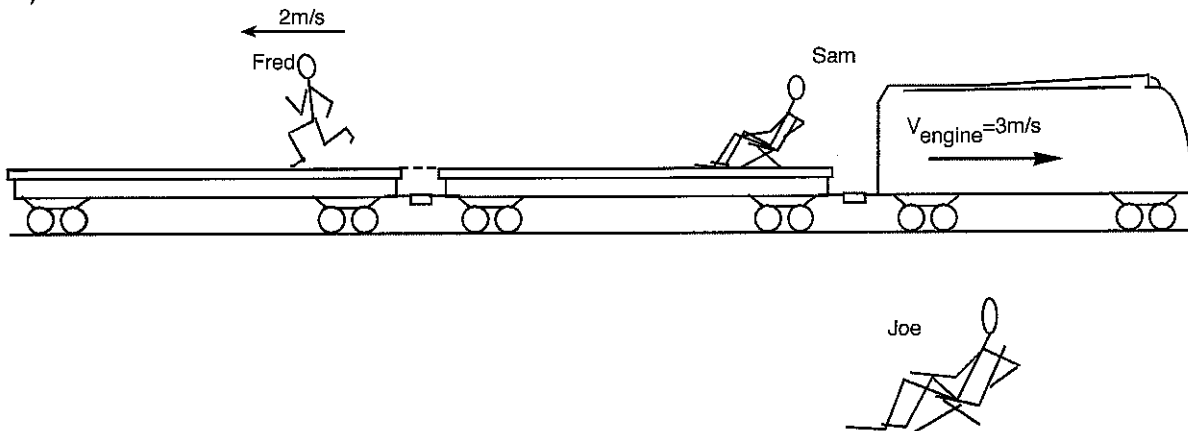


Figure 2.23

After reaching the front of the train Fred turns around and jogs toward the rear of the train, at a steady two m/sec. Answer the following questions including units and directions on vector quantities.

a.) During a 10 second period how much distance does Fred travel as seen by Sam?

\_\_\_\_\_

b.) What is Fred's displacement, during the 10 second period, as seen by Sam?

\_\_\_\_\_

c.) During the ten second period find Fred's displacement as seen by Joe.

\_\_\_\_\_

d.) With what velocity does Sam see Fred moving?

\_\_\_\_\_

e.) What is Fred's velocity as seen from Joe's point of view?

\_\_\_\_\_

f.) Explain why Fred's walking looks funny from Joe's viewpoint?

\_\_\_\_\_

\_\_\_\_\_

3.)

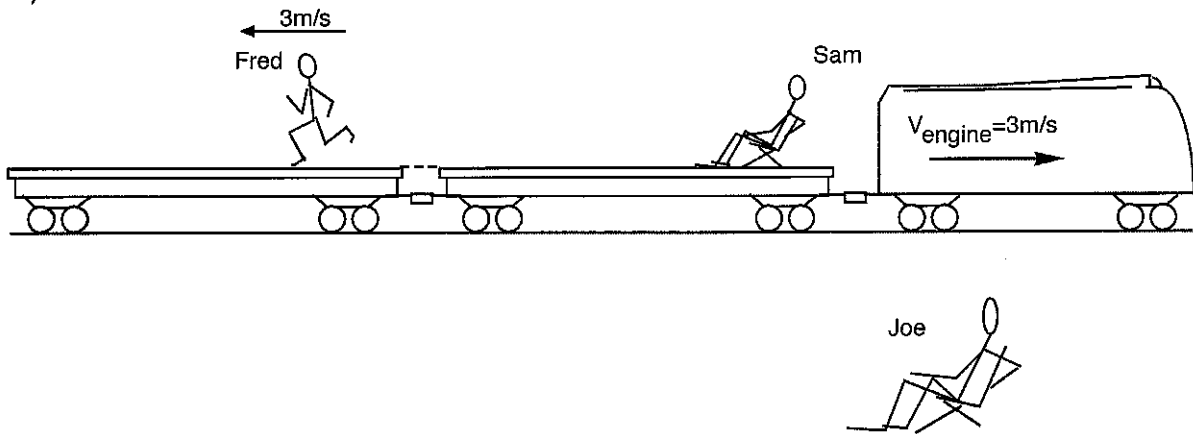


Figure 2.24

Now Fred tries jogging toward the rear of the train at a speed of three m/sec.

Answer the questions below.

a.) During a 10 second period how much distance does Fred travel as seen by Sam?

\_\_\_\_\_

b.) Find Fred's displacement during a ten second period as seen by Joe.

\_\_\_\_\_

c.) With what velocity does Sam see Fred moving?

\_\_\_\_\_

d.) What is Fred's velocity as seen from Joe's point of view?

\_\_\_\_\_

e.) What does Fred appear to be doing from Joe's point of view?

\_\_\_\_\_

4.)

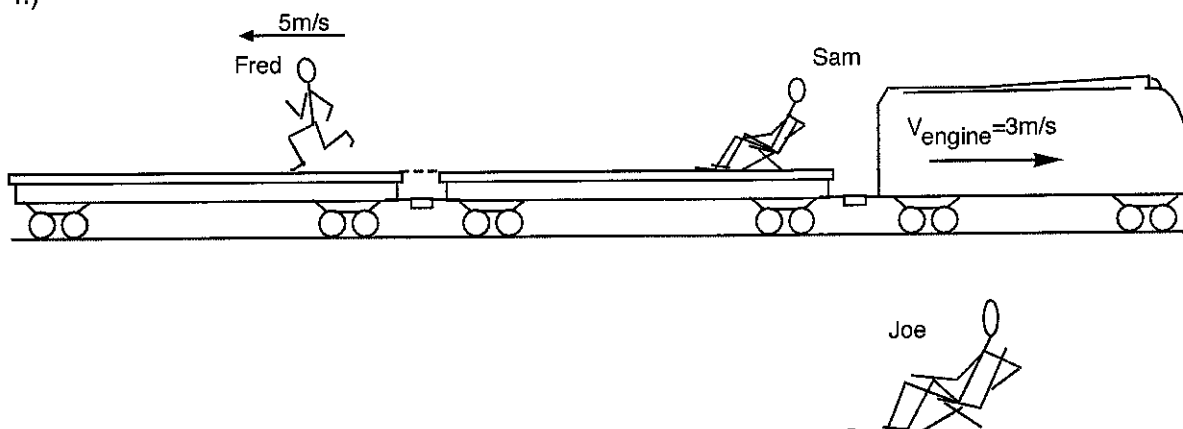


Figure 2.25

Having regained his ambition, Fred starts running toward the rear of the train at his original five m/sec.

a.) Determine Fred's displacement with respect to the train during a 10 second period.

\_\_\_\_\_

b.) What is Fred's displacement with respect to the ground during the 10 second period?

\_\_\_\_\_

c.) Find Fred's velocity with respect to the train.

\_\_\_\_\_

d.) Find Sam's velocity with respect to the ground.

\_\_\_\_\_

e.) Find Fred's speed with respect to the ground.

\_\_\_\_\_

f.) What is Sam's speed with respect to the train?

\_\_\_\_\_

5.) Fred gets bored and decides to try running across the train. He faces North and runs at a steady speed of 4 m/sec for five seconds. Construct a neat and clearly labeled vector diagram as needed.

a.) Draw a sketch below showing an overhead view of the train with vectors sketched for Fred's velocities as seen by Sam and Joe.

b.) Find Fred's speed with respect to the train. \_\_\_\_\_

c.) Find Fred's distance with respect to the ground. \_\_\_\_\_

d.) Find Fred's velocity with respect to the train. \_\_\_\_\_

e.) Find Fred's velocity with respect to the ground. \_\_\_\_\_

f.) Find Joe's velocity with respect to Sam. How do you need to change your thinking to answer this question?

\_\_\_\_\_

6.) Go back and check:

Did you include a magnitude and a direction on all of your *vector* answers?

7.) Finally, Fred faces toward bearing 40 degrees (40 degrees East of North) and walks diagonally across the flat car at a speed of 2 m/sec for a period of 5 seconds. Include a neat and clearly labeled vector diagram below. Then determine the values indicated below.

a.) Fred's speed with respect to the train. \_\_\_\_\_

b.) Fred's distance with respect to the ground. \_\_\_\_\_

c.) Fred's velocity with respect to the train. \_\_\_\_\_

d.) Fred's velocity with respect to the ground. \_\_\_\_\_

e.) Joe's velocity with respect to Sam. \_\_\_\_\_