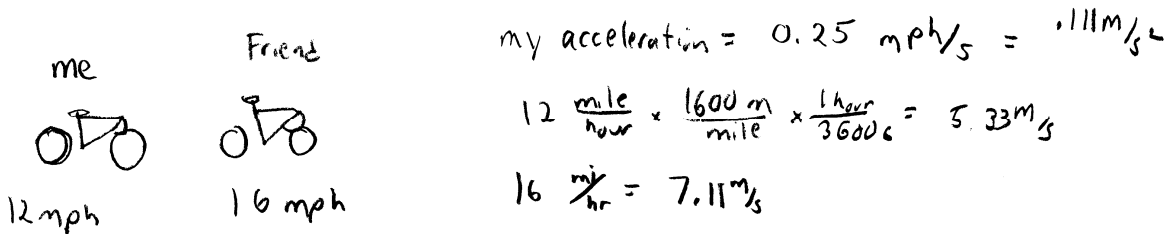


Problem B

FOCUS the PROBLEM

Draw a picture of the situation including ALL the information given in the problem.



(Have you written all of the information in the problem into this section?)

Question(s): What is the problem asking you to find?
(Be specific and write in plain English?)

How much time passes before I catch my friend.

Approach: Outline the approach you will use.

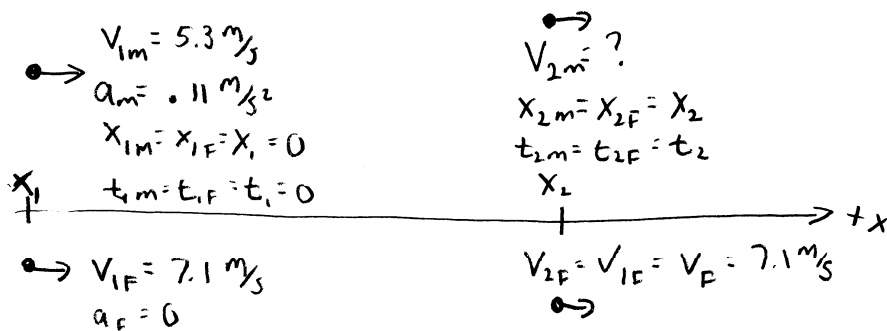
(Write something here so that someone else could read it and know what you are doing. Part of this approach should state specifically that you will be using the kinematic equations.)

Use kinematic equations with acceleration = 0 for friend and constant acceleration for me. Derive the time when we are both at the same point.

DESCRIBE the PHYSICS

Draw physics diagram(s) and define ALL quantities uniquely.

(Draw motion diagrams whenever you used kinematic equations. Always draw and label the x axis and the y axis, if needed. Each important time in this problem should be diagrammed for each individual. Unique and appropriate subscripts must be used.)



(You can also write down things that are equal here, like $x_{2m} = x_{2f} = x_2$.)

Which of your defined quantities is your Target variable(s)? Write down which of the variables above will answer the question you are trying to solve. In this example, there is only one target variable, so only one thing should be written down using the exact subscripts you used in the above diagram.

t_2

Quantitative Relationships: Write equations you will use to solve this problem.

(Write general forms of the equations you may use.)

$$x_2 - x_1 = v_1(t_2 - t_1) + \frac{1}{2}a(t_2 - t_1)^2$$

$$v_2^2 = v_1^2 + 2a(x_2 - x_1)$$

$$v_2 = v_1 + a(t_2 - t_1)$$

PLAN the SOLUTION

Construct Specific Equations (Same Number as Unknowns)

Start with an equation with the target variable in it and use the exact notation and subscripts you defined in the previous part of the problem. Keep track of the number of variables which are unknown and keep adding equations until the number of equations is equal to the number of unknowns. Do all the algebra first so that at the end you have a single equation which solves for your target variable.

Write Equations here:

Write Unknowns here

$$x_{2F} - x_{1F}^0 = v_F (t_2 - t_1^0)$$

$$x_2 = v_F t_2 \quad (1) \quad x_2, t_2$$

$$x_{2M} - x_{1M}^0 = v_{1M} (t_2 - t_1^0) + \frac{1}{2} a_m (t_2 - t_1^0)^2$$

$$x_2 = v_{1M} t_2 + \frac{1}{2} a_m t_2^2 \quad (2)$$

2 equations, 2 unknowns

Plug x_2 from (1) into (2)

$$v_F t_2 = v_{1M} t_2 + \frac{1}{2} a_m t_2^2$$

$$v_F - v_{1M} = \frac{1}{2} a_m t_2$$

$$t_2 = \frac{2(v_F - v_{1M})}{a_m}$$

Check Units

Use dimensional analysis to make sure your answer has the correct dimensions. Use symbols like [L] for length and [T] for time.

$$[T] = \frac{\frac{[L]}{[T]}}{\frac{[L]}{[T]^2}} = [T] \quad \text{ok}$$

EXECUTE the PLAN

Calculate Target Quantity(ies)

Now just plug in numbers into the equation you derived in the last section.

$$t_2 = \frac{2(7.11 \text{ m/s} - 5.33 \text{ m/s})}{0.111 \text{ m/s}^2} = \boxed{32 \text{ s}}$$

EVALUATE the ANSWER

Answer the questions below completely and thoroughly.

Is Answer Properly Stated?

Yes, in seconds

Is Answer Unreasonable? No, check distance

$$x_{2F} = (7.11 \text{ m/s})(32 \text{ s}) = 230 \text{ m}$$

$$x_{2M} = (5.33 \text{ m/s})(32 \text{ s}) + \frac{1}{2}(0.111 \text{ m/s}^2)(32 \text{ s})^2 = 230 \text{ m}$$

So we both travel same distance!
Is Answer Complete?

Yes

When you get to here, you're done!

(extra space if needed)

Write your Group Number here and the names of the group members who are present.

Group Number: _____

Name: Key

Name: _____

Name: _____

Name: _____