On the Move: Teacher Notes

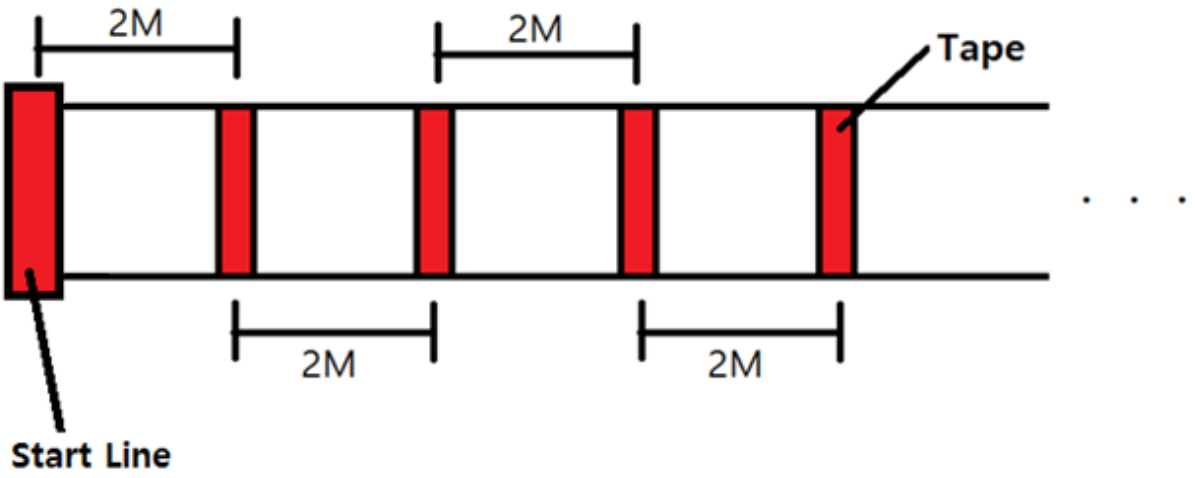
Groups of 2-4 are recommended.

Materials:

- Timer
- Tape
- Meter stick

Directions:

1. Setting up the experiment:
    a. Students will follow the instructions that were provided on activity to set up the experiment.
    b. On the ground tape 2-meter marks for 12 meters (see diagram) there will be 7 tape marks total.



2. Group students per your discretion.
3. One group member will physically walk and run per instructions.
    a. A wheelchair bound or physically challenged student who is capable of multiple speeds may also choose to participate.
    b. Remaining group members will use stopwatches and time when the tape marks are crossed.
4. Calculations
    a. The calculation for velocity is the change in distance (m) over the change in time (seconds):

$$\frac{\Delta d}{\Delta t} = \frac{d_2 - d_1}{t_2 - t_1}$$

1. For this calculation, each distance interval will be 2 meters.

b. The calculation for acceleration is the change in velocity (m/s) over the change in time (seconds):

$$\frac{\Delta v}{\Delta t} = \frac{v_2 - v_1}{t_2 - t_1}$$

1. The *velocity interval* (in the acceleration calculations and questions section) should be determined from the calculated velocities in the previous table.
2. The *change in time* column for the acceleration table should be calculated from the *change in time* column in the velocity table (in the velocity calculations and questions section), not from the distance table (in the data section).

5. Graphing
   a. When the students graph the distance vs. time data, ensure that each axis is given a label and units. Students may need some help determining appropriate intervals for the x-axis (time).
   b. When graphing the velocity data, use the velocities calculated in the *velocity calculations and questions* section. For the time, use the times in the *data* section (distance vs. time collected by the student) starting with the time for 2m.
      1. Velocity is in m/s; therefore, the time used for plotting is the end time of the interval used to calculate the velocity (the time from 0-2m).
   c. When graphing the acceleration data, use the acceleration calculated in the *acceleration calculations and questions* section. For the time, use the times in the *data* section (distance vs. time collected by the student) starting with the time for 4m.
      1. Acceleration is in m/s^2; therefore, the time used for plotting is the end of the time interval used to calculate the acceleration (two time intervals: the times from 0-2m and 2-4m).
   d. Have the students discuss what they observed during the experiment and how that relates to what they see on the graph.
6. Collect filled out worksheet from the students and grade based on the following rubric:

Item/Score	0	1	2	3
Graph	Students did not attempt to plot the data, label the axes or determine the best interval for time.	Students had numerous plotting, labeling, or interval errors in their graphs.	Students had some plotting, labeling, or interval errors in their graphs.	Students had few or no errors for each graphs.

Calculation	Students did not show their work and had incorrect answers.	Students had the correct answer but did not show their work.	Students did not have the correct answer but showed their work and the processes or formulas were correct.	Students had the correct answer and showed their work. Their processes or formulas were correct.
Explanations	Students did not write any response.	Student wrote a non-scientific response.	Students wrote a response with an incomplete scientific explanation.	Students wrote a response with a complete scientific explanation.

7. Differentiation
    - For special education students, label the axes and determine appropriate time intervals for them to plot their data.
    - For ELL students, model the activity, calculations, and graphing.
    - For high achievers, use tables without headers and graphs without any labels on the axes.