An Olympic runner is coming to visit your school. You have been told that a world class race has two stages. In the first stage, the runner accelerates at a constant rate until he reaches maximum velocity. In the second stage, the runner runs at maximum velocity until the end of the race. Your physics class has been tasked with designing an experiment to measure the acceleration of the runner for a ¼-mile run. Your class has twelve students to work together on this experiment. Design an experiment that will enable your class to calculate the acceleration. Your description must include:

* A list of equipment you will need
* A diagram of your experimental set up
* Step by step procedures to follow
* List of data to be collected
* Sketch of the position vs. time, velocity vs. time and acceleration vs. time graphs for this run, including labeling of the time when maximum velocity is reached on all three graphs.
* Description of how the data will be used to calculate acceleration including equations

**Checklist:**

As you complete your assignment, please review the checklist below to ensure that you have included all needed items.

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| ***Your assignment should include all of the criteria listed below to receive full credit.*** | |
| **Included?** | **Item** |
|  | 1. Equipment list includes length and time measuring devices. |
|  | 1. Diagram shows evenly spaced positions where timekeepers will be placed. |
|  | 1. Procedure includes: measuring distance, measuring time, and some way to distinguish between the time period of constant acceleration and constant velocity. |
|  | 1. List of data collected includes multiple times and positions, with a minimum of ten positions. |
|  | 1. Kinematics graphs has two regions. Position vs. time graph is concave up and then linear (positive slope). Velocity vs. time graph is linear (positive slope) and then horizontal. Acceleration vs. time graph is constant and then zero. |
|  | 1. Accurate method for calculating acceleration is described. For example: Measure the distance where maximum velocity is achieved and the time when this occurs. Values substituted into x = vot + ½ at2, where vo = 0. |
| ***You may need to use resources outside of this course to complete this assignment. If so, please submit a Works Cited document. If you need assistance, visit the Developmental Module for information on citing any resources that you used.*** | |
| **Included?** | **Item** |
|  | For resources used outside of the course, a Works Cited document is submitted along with the assignment. |