1. **Motion with constant speed**

Obtain a ruler and at least one ticker tape segment. All the tape segments were generated using the same ticker tape timer. Do not write on or fold the tapes. If a ticker timer is available, examine it so that you are familiar with how it works.

1. Describe the motion represented by your segment of tape. Explain your reasoning.

1. Compare the tape segment of those with your partners.

How does the time taken to generate one of the short segments compare to the time taken to generate one of the long tape segments? Explain how you can tell.

Describe how you could use your answer above to arrange the tape segments in order by speed.

1. Suppose the ticker timer that made the dots strike the tape every 1/60th of a second.

How far did the object that generated your tape segment move in: 1/60th of a second? 2/60th of a second? 3/60th of a second? Explain how you figured out your answer.

Predict how far the object would move in: 1 second, 1/120th of a second. Explain the assumption(s) you used to make your predictions.

1. In your own words, describe a procedure you could use to calculate the speed of an object.
2. Determine the speed of the object that generated each of your tapes. Record your answers below. Give an interpretation of the speed of the object, i.e., explain the meaning of the number you just calculated. Do not use the word “speed” in your answer. (Hint: which of the distances that you calculated in part C is numerically equal to the speed?)

Write the speed of the objects that generated each tape on a small piece of paper. Express your answer in terms of centimeters and seconds.

1. A motion that generates a sequence of evenly-spaced dots on a ticker tape is called motion with a constant speed. Discuss with your partners whether the object that generated your tape was moving with constant velocity. Explain how your group determined the answer.
2. **Motion with varying speed**
3. In the space below, sketch a possible ticker tape resulting from motion with varying speed and write a description of the motion.

How can to tell from your diagram that the motion has varying speed?

1. Together with your classmates, take the ticker tape segments and arrange yourselves in a line, ranked according to the speed of the segments. Discuss the following questions as a class.

Compare your segment of the ticker tape to neighboring tape segments. What do you observe?

Compare the smallest and largest speeds. What do you observe?

1. Based on your observations of your tape segment and the tape segments of the other members of your class, answer the following questions.

Is each small tape segment a part of a motion with constant or varying speed?

Did your examination of a single, small tape segment reveal whether the entire motion that generated the tape had a constant or varying speed?

1. Review your earlier interpretations of the speed for your small tape segment. (See section 1). Is that interpretation valid for the entire motion that generated the tape?

Based on the speed for your piece of tape, could you successfully predict how far the object would move in: 1/60th s? 2/60th s? 1 s?

**Teacher Note:** The following activity was modified from Tutorials in Introductory Physics by McDermott, Shafer et al. The Tutorial (as originally written) assumes that the students have had some lecture instruction on constant velocity motion and is written at a reasonably high reading level. Some questions have been omitted (for time constraints and for focus) and others have been edited for readability.