Dot Diagrams

Unit: Kinematics (Motion) in One Dimension

NGSS Standards/MA Curriculum Frameworks (2016): HS-PS2-10(MA)

AP® Physics 1 Learning Objectives/Essential Knowledge (2024): 1.3.A.1

Mastery Objective(s): (Students will be able to…)

- Represent the motion of an object using dot diagrams.
- Describe the motion of an object based on its dot diagram.

Success Criteria:

- The dot diagram correctly shows the position of the object at each time interval.
- The description of the object's motion is correct.

Language Objectives:

- Describe the motion of an object as a sequence of events from beginning to end.

Tier 2 Vocabulary: position, velocity, acceleration

Lab Activities & Demonstrations:

- Record the motion of objects using a paper tape counter.

Notes:

The following is a famous picture called "Bob Running", taken by Harold ("Doc") Edgerton, inventor of the strobe light.

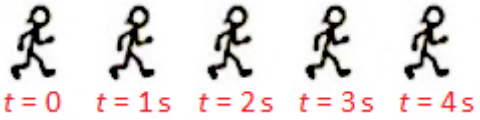
To create this picture, Edgerton opened the shutter of a camera in a dark room. A strobe light flashed at regular intervals while a child named Bob ran past. Each flash captured an image of Bob as he was running past the camera.

The images show that Bob was running at a constant velocity, because in each image he had travelled approximately the same distance relative to the previous image.

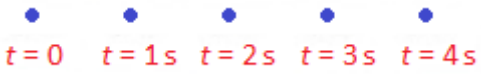
Use this space for summary and/or additional notes:

If we simplify the picture and replace the images of Bob with stick figures, they might look like this:

If the time between flashes of the strobe light was exactly one second, we would know where the stick figure was at every second:



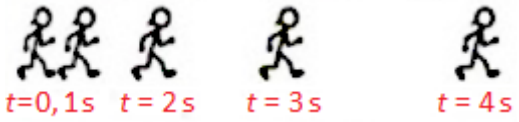
Notice that our stick figure travels the same amount of distance from one second to the next, because its velocity is constant. If we replaced the stick figures with dots, our diagram would look like this:



This is called a "dot diagram". As with the stick figures, if the velocity is constant, the space between each dot and the next will also be constant.

dot diagram: a diagram that represents motion as a series of dots with a constant interval of time between each dot.

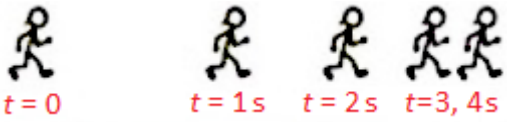
If our stick figure were accelerating, the diagram might look like this:



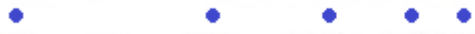
which would give the following dot diagram:

As our stick figure speeds up, it travels farther from one second to the next, which is why the dots get farther apart.

Similarly, if our stick figure were slowing down (negative acceleration), the diagram might look like this:



which would give the following dot diagram:



As our stick figure slows down, it travels less distance from each second to the next, which is why the dots get closer together.

Use this space for summary and/or additional notes: