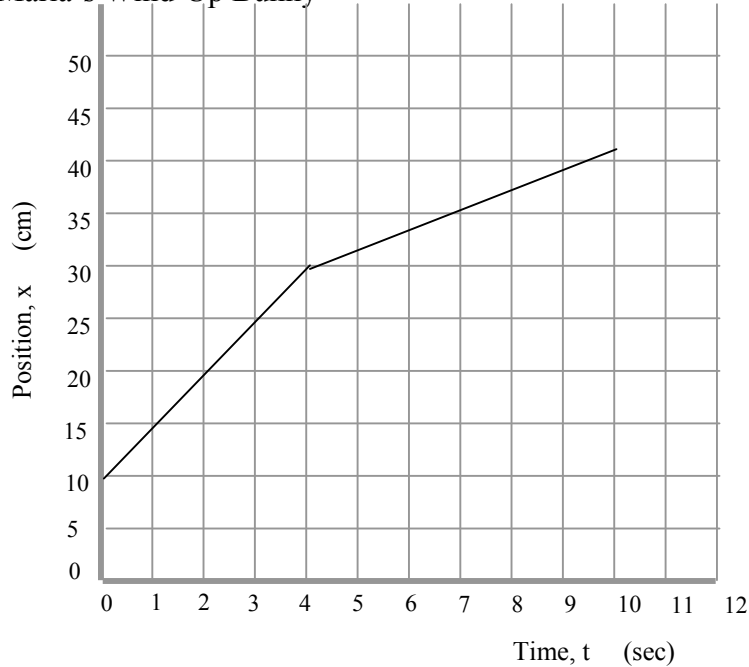


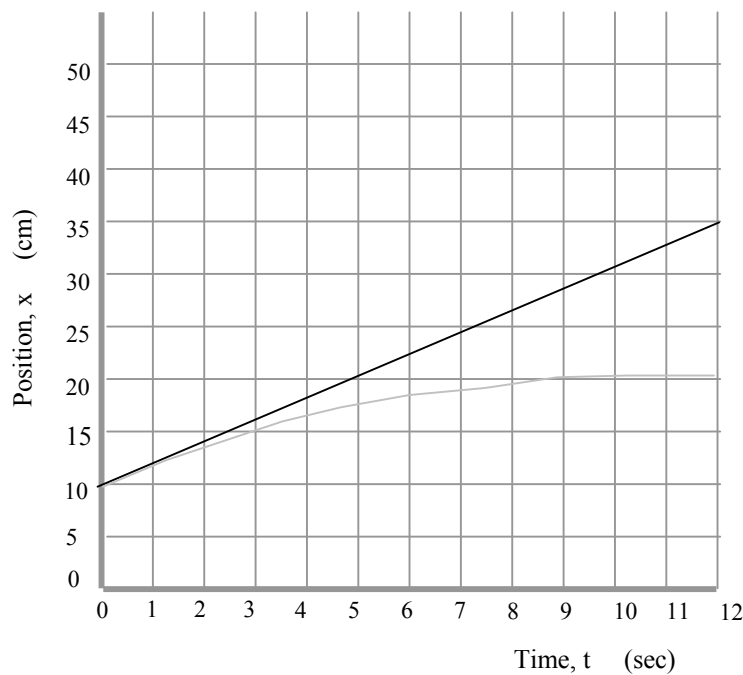
Maria and Tuan

1. Maria's Wind-Up Bunny



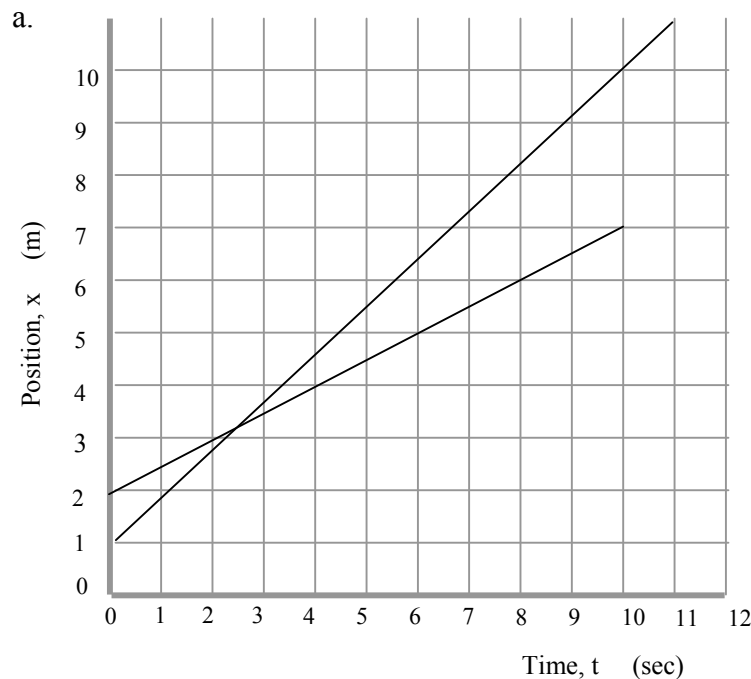
- From either the data list or the graph coordinates, the toy is at the 30-cm mark when the watch reads 4 seconds.
- The toy moves at constant speed for the first 4 seconds; then moves at a slower (but again constant speed) for the last 6 seconds. But its speed for the full 10 seconds is not constant.
- By finding the slope, the speed is 2 cm/s. $v = \frac{42\text{cm} - 10\text{cm}}{10\text{s} - 0\text{s}} = 2 \frac{\text{cm}}{\text{s}}$

2. Tuan's rollerblading:

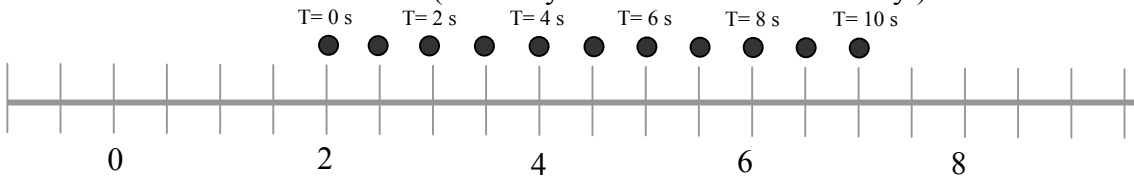


- Tuan is 22 m from the origin at $t = 6$ s. This can be read by interpolating the graph.
- $x = 2.0 \frac{m}{s} t + 10.0m$ from position = slope(time) + vertical intercept
- $x = 2.0 \frac{m}{s} \times 5.0s + 10.0m = 20.0m$, which matches the graph at $t = 5$ s
 $x = 2.0 \frac{m}{s} \times 9.0s + 10.0m = 28.0m$, which also matches the graph.
- The slope is constant so the speed is constant. The gray line shows what the graph might look like if Tuan had decreased speed during this time.

3. Jack, the toddler: Put values of 1 to 10 sec into the model function and plot the resulting positions.



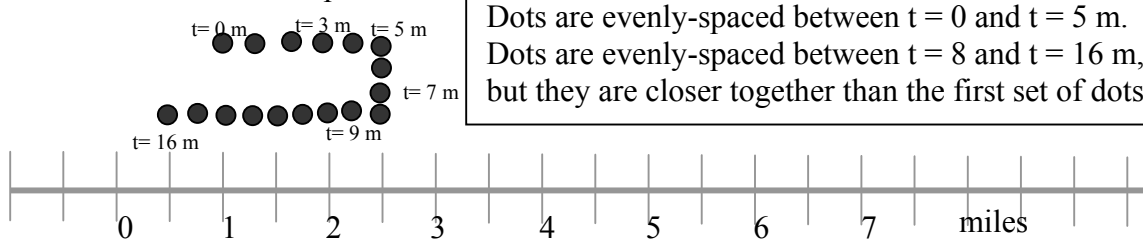
b. The dots should be equally spaced starting at a 2.0-m mark and ending at the 7.0-m mark. (You may have numbered differently.)



- At $t = 25$ s, $x = 0.5 \frac{m}{s} \times 25.0s + 2.0m = 14.5m$, which is off the scale of the graph and motion map drawn here.
- Owen's line is in light gray. His function is $x = 1.0 \frac{m}{s} t + 1.0m$. Note that Owen passes Jack at $t = 2.5$ s at about the 3.3-m position mark.

4. Bria's bike ride:

a. Motion map



b. The speedometer reading matches the slope of the graph for the first five minutes:

$$m = \text{speed} = \frac{2.5mi - 1.0mi}{5.0m - 0m} = 0.33 \frac{mi}{m}$$

c. For the last five minutes the slope (and speed) is:

$$m = \text{speed} = \frac{0.5mi - 1.75mi}{16.0m - 11.0m} = -0.25 \frac{mi}{m}, \text{ a slightly slower speed in a different direction}$$

- d. Between $t = 5$ min and $t = 8$ min, Bria is at rest at the 2.5 mile marker, probably having a juice.
- e. At $t = 6$ minutes Bria is 2.5 miles from the trail origin.
- f. Bria travels 1.5 miles out on the trail and 2.0 miles back for a total distance of 3.5 miles.
- g. At $t = 16$ minutes, Bria is 0.5 mile from her initial starting point (in a direction opposite from her initial direction of travel).
- h. We cannot write a single mathematical model for her whole trip because she has different speeds. We could write a model for the first 5 minutes without any trouble, however.