Name: _____ Period: _____ Date: _____

When do they meet?

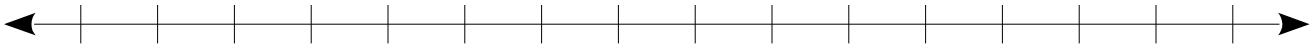
One Saturday morning, Antonia and Beatrix both go for a run on the same path. Use the information below to figure out when they will meet each other. (That is – find the time, t, when they both have the same position, x.)

Antonia gets on the trail right where it starts. She runs with a constant speed of 8 km/h.

Beatrix gets on the trail at the 2.5 km mark, but runs at a speed of 6 km/h.

Method I: Motion map

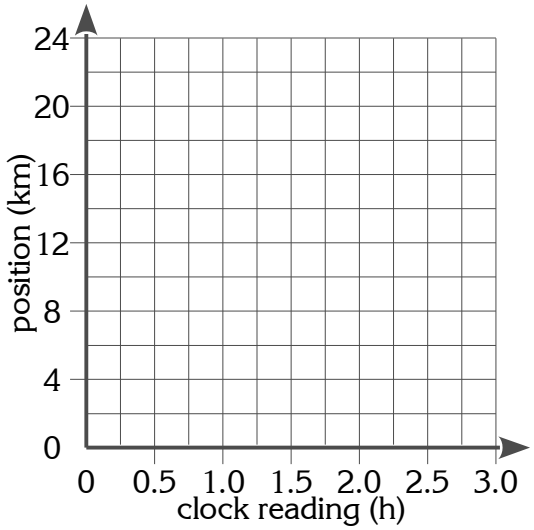
Construct a motion map for the run, with both runners on the same map. Place one dot for every 15 minutes (that's 0.25 hours). Continue the map for 2 more dots after they meet.



At what time do the runners have the same position? Circle their meeting spot on your map.

Method II: Position-time graph

Construct a position-time graph for the run, with both runners on the same graph. Their motions are uniform so you can be sure their graphs will be straight lines.



At what time do the runners have the same position? Circle their meeting spot on your graph.

Method III: Algebra

Write a position equation to describe each runner's motion. You will need to fill in the values for their starting position, x_i, and their velocity, v. (The position equation is $x_f = x_i + v\,\Delta t$.)

Antonia's equation:

Beatrix's equation:

You now have a system of two equations with two unknown variables: Δt and x_f.

But, if the two runners are at the same place at the same time, that means there's some amount of time you can put in for Δt that will make both equations give the same x_f. So, you can set the two equations equal to each other! That is, put Antonia's "$x_i + v\,\Delta t$" equal to Beatrix's "$x_i + v\,\Delta t$", and solve for Δt.

At what time do the runners have the same position?