Math Exam – PreIB 3.AB 2

Systems of Linear Equations

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DON'T FORGET TO EXPLAIN EVERYTHING EVEN IF YOU THINK IT'S OBVIOUS!

I'm following the path of two trains (A and B) **on the same track** that are now both stationary.

I know that train A has an average speed of **60 km/h** and train B travels on average at **100 km/h**. I also know that train A is at this moment 3 times as far from the depot as train B is.

I denote by y **the distance** (in km) train B is from the depot. I also denote by x **the time** (in hours) both trains have travelled for from the moment they started moving.

(a) Express **the distance from the depot** of these two trains as linear functions $A(x, y)$ and $B(x, y)$ with inputs:

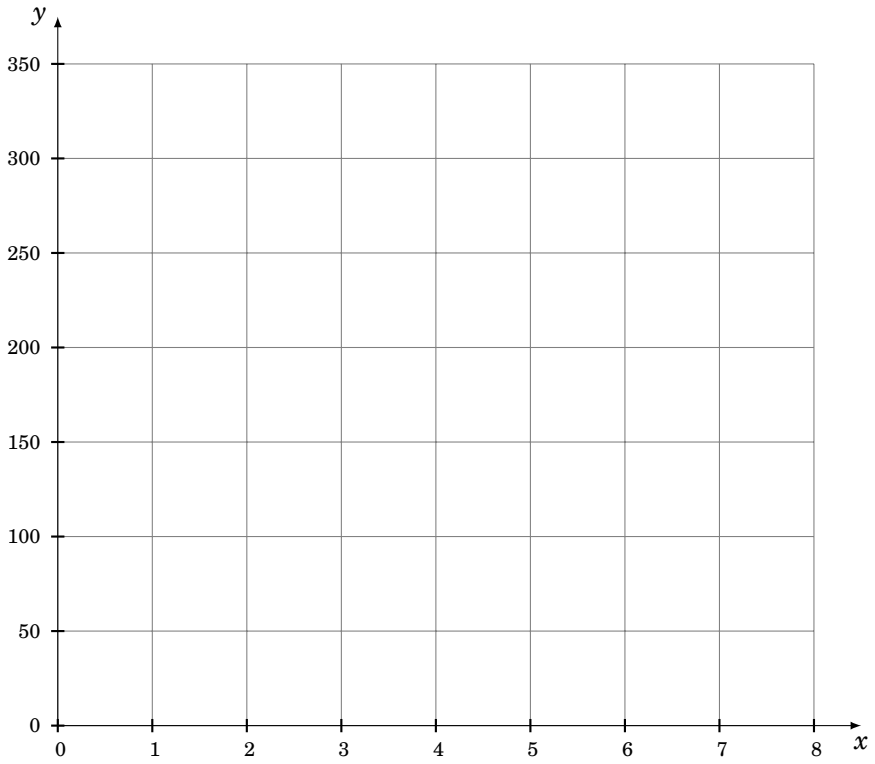
- the time they have been moving (x) and
- their initial distance from the depot (y).

The terminal station of train A is 330 km away from the depot and the terminal station of train B is 350 km away from the depot. I know that both trains **reached the terminal station at the same time**.

(b) Write a system of two linear equations in two variables which will allow me to calculate how long the trains travelled to their terminal station (x) and their initial distances from the depot (y).

(c) Solve the system.

(d) Interpret the equations of the system as linear functions in one variable. Draw their graphs as lines (it needn't be precise). You may want to use the following grid. **Make sure you are drawing them correctly. Their intersection must be the solution to the system.**



(e) Let's say I add another train, C. This train starts moving at the exact same time as A and B at **80 km/h**. Its initial distance from the depot is **twice that of** A and the distance of its terminal station from the depot is **400 km**.

As you did before, express the initial distance of C, that is, the variable y, as a linear function dependent on its velocity (x). Finally, draw the graph of this function (ideally to the same grid as A and B).

(f) Does C reach its terminal station at the same time as A and B? – **Read this information from the graph!**

If not, **change its velocity** so that it does reach its terminal station together with the two other trains (you do **not** have to draw the graph of the changed linear function).