

ASSEMBLY LINES

INTRODUCTION

Give students a summary of Systems Engineering, Assembly Lines, Reverse Engineering, and the Design Process. This is one of the rare times you will want to give explanation before activity. You might give students examples of other assembly lines. In an assembly line, each person does a specific task over and over. One person's task is different from what the others are doing.

Review the parts of the pen and any necessary details of how to take them apart and put them back together. Conduct the Assembly Line activity.

MATERIALS

- + Six retractable ball point pens that can be taken apart
- + Six paper or plastic plates (optional—to keep the parts from going all over the place)
- + A stopwatch

STANDARDS

Students will be engaging directly in the Science and Engineering Practice of Defining Problems. They are developing a process using multiple criteria and constraints (so its almost the definition of that practice). It is almost completely divorced from disciplinary concept, so it is an opportunity to focus on the skills of engineers. It works great as a beginning of school team-builder. It is also a great activity for parents on open-house night—they can see how you run your class without having to know exact content.

NAME:

DATE:

ASSEMBLY LINES

At home do you put all your clothes in one drawer all mixed up, or do you have a drawer for socks, a drawer for shirts, and places for every kind of thing? For school do you just shove everything loose in your backpack, or do you have a notebook with dividers and sections for every class? Do you have different folders for different classes? Does your school have buses that roam the neighborhood looking for kids who need to come to school, or do they have set bus routes?

These are all questions about systems engineering. A systems engineer designs processes and procedures and systems to get things done efficiently. If you keep your clothes organized in different drawers, you are a systems engineer. The person at your school who sets up buses and drop-off points might be called an operations manager. Operations research is another name for systems engineering.

One way that engineers design great things is by taking already-made things apart to see how they work and to figure out improvements. This process is called reverse engineering. For example, in World War II, the United States captured some Japanese airplanes and took them apart to see how they worked. This procedure provided information on the strengths and weaknesses of the Japanese planes and the best ways to defeat them.

An important strategy for putting things together efficiently is to use an assembly line. In an assembly line, different parts of a process are completed by different people in different places. For example, cars are usually built on an assembly line. This approach is easier because one part is put on in only one place at one time. For example, tires and tools needed for assembly are located in a specified place. Likewise, windshields are assembled in a different location. This approach means that if something goes wrong, like if the carburetor doesn't work, you can determine where something went wrong and how the error might be corrected. Every car should come out the same because the same person put together the same parts in the same order for every car.

In this activity, you will put design an assembly line to manufacture pens ball point pens. Your team will design and test processes to put the pens together. You will modify your design and practice your process to get faster and more efficient.

At the end, there will be a competition. The team that can assemble six pens that work in the shortest amount of time will win the contract for pen assembly!

TRIAL	VARIABLE CHANGED	TIME	CHANGE IN TIME	NOTES / OBSERVATIONS
Trial 1				
Trial 2				
Trial 3				
Trial 4				
Trial 5				
Trial 6				
Trial 7				

Describe your first assembly line attempt (include a diagram):

Describe your final assembly line attempt (include a diagram):