

### Overview

Automata are whimsical and wonderful machines that combine art, play, humour, science and engineering. They have a long history that appears to transcend geography and culture.

Cuckoo clocks with movable figures and mechanical bell ringers, often found in medieval European churches, are examples of automata, as are complex toys with multiple movable parts from Japan and China. Some of the earliest mention of automata can be found in Greek mythology where Prometheus was tortured by an artificial eagle for giving fire to humans. If you are unfamiliar with automata, please watch <https://www.youtube.com/watch?v=9OqEze9JTU0>.

### Design Rationale

In Design Challenge 2, *Using Machines to Make Overly Complex Compound Machines*, we introduced the concept of mechanical advantage. Automata are complete units that typically tell a short story—someone chopping wood, a horse running, etc. They utilize a combination of levers, cranks, linkages, cams, shafts, ratchets, gearing, and drives.

For specific tips on how to make an automata out of simple materials, please refer to [https://www.exploratorium.edu/sites/default/files/tinkering/files/Instructions/cardboard\\_automata\\_guide\\_final\\_screen.pdf](https://www.exploratorium.edu/sites/default/files/tinkering/files/Instructions/cardboard_automata_guide_final_screen.pdf).

### Problem Scenario

Your team has been selected to produce an interesting, complex, narrative automata that uses as many mechanical combinations as possible (i.e. levers, cranks, linkages, cams, shafts, ratchets, gearing, and drives).

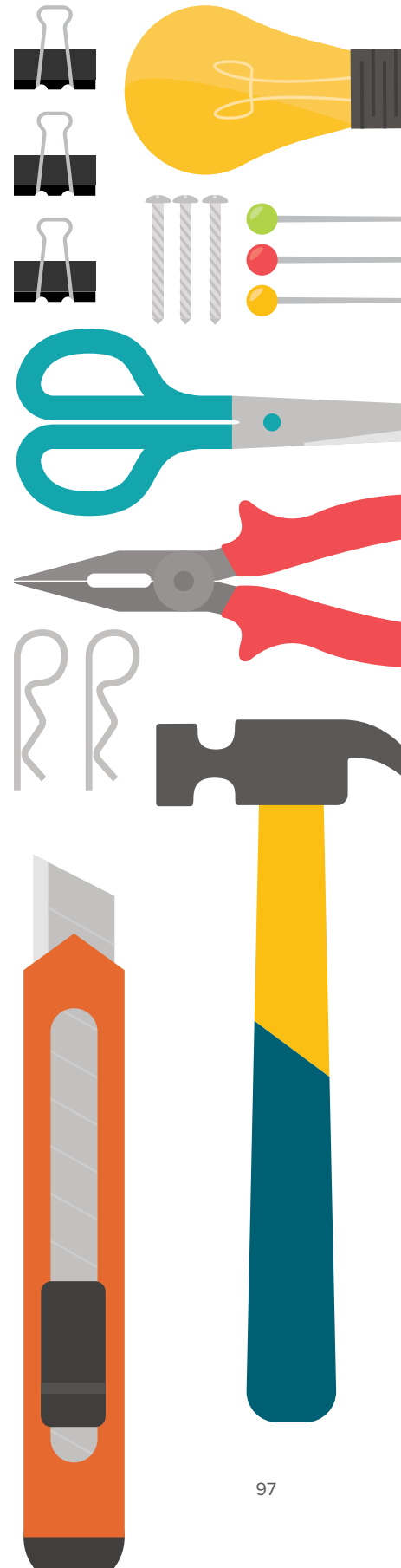
### Success Determinants

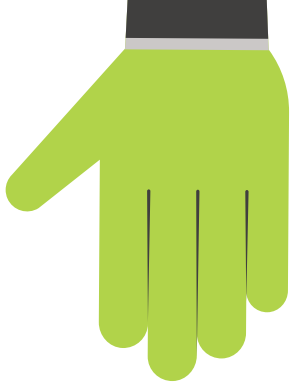
Success will be determined by the degree to which your design solution:

- Addresses the issues suggested in the design challenge
- Is aesthetic and complex
- Identifies the various mechanical functions of an automata

### Parameters

- Choose consumable items and materials found in the shared pantry to aid in the enhanced development of your group's prototype.
- Use the tools that have been provided at the shared tool station.
- Use at least two mechanical combinations (i.e. levers, cranks, linkages, cams, shafts, ratchets, gearing, and drives).





### Note

If you this position this challenge in Social Studies or English, the students' automata might be a specific character doing contextually relevant task. For example, if students were reading the novel *The Old Man and the Sea*, the automata might be an older man fishing from a boat. If students were studying the exploration of the Northwest Passage, the automata might be people paddling a canoe. Also, please note automata differ from Rube Goldberg machines as automata are narrative while Rube Goldberg machine are excessive in their complexity!

