Toy Workshop Build Guide

WARNING! Small Parts, Choking Hazard, For ages 7 and Up. Use Only with Adult Supervision.
Gather these components for your pull/push toy. Extra components are included to help you to create your own unique design.

3 - Strips
5 - Dowels
2 - Hole Plates
4 - Wheels

300mm (12in)

8 - Screws
4 - Nuts
1 - Slide Stop

25mm (1in) #10
#10
10cm (3in)

This isn’t a kit. You’re going to really build (cut, ream, screw) your Toy. Here are tools you’ll need to get started. They can be shared by up to 4 groups at a time.

- TeacherGeek Reamer
- TeacherGeek Multi-Cutter
- Tapping Block - Optional
- Small Hammer
- Pliers - Optional
- Philips Screwdriver

Get individual tools, or the complete TeacherGeek / Maker Tool Set
Single SKU 1823-24
Class Set SKU 1823-85

Tip: Save all your materials (even what you cut off). Keep them in a bag. They can be used later.
**Cut**

*Multi-Cutters* cut wood & plastic (like dowels and connector strips). They do not cut metal.

**Push, Wiggle,**

Push, wiggle or tap *dowels* into holes.

**Tap**

Use a hammer and slider block to tap *dowels* farther thru holes.

**Quick Tip!**

Use a crayon, or soap on the end of a Dowel to make building easier.

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**Ream**

Most parts have holes with *teeth*. The *teeth* hold *dowels* (keep dowels from falling out).

A reamer removes teeth from a hole. This allows a *dowel* to spin in the hole.

Only ream holes where dowels should spin.

Never ream pulleys, gears, wheels, or any hole a *dowel* stays stuck in.

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**Screws & Nuts**

Screws (without nuts) can connect parts, and allow them to rotate.

Screws (with a nut) can connect parts, and keep them from rotating.

**Stop Clip**

Press a *stop clip* onto a *dowel* to keep it from sliding or use it as a hook for a string / rubber band. It takes little force to get it on.

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**Slide Stop**

Cut *slide stop* into sections. Use *slide stop* on *dowels* to stop dowels from sliding thru reamed holes.
Build The Frame

1. **Cut four 10cm (4in) dowels.**

2. **Tap or push the dowels into an upside-down hole plate.**

3. **Tap or push a hole plate onto the dowels.**

Congratulations! Your frame is done.

If you are going to do the optional Sled Race, it's now time.

Documents at [teachergeek.com/learn](http://teachergeek.com/learn)
4. **Cut two 13cm (5in) dowels.** These will become axles for your wheels.

5. **Push or tap the two dowel axles into wheels.**

6. **Place the axles into the frame.**

7. **A) Cut two 3cm (1in) dowels.**

   **B) Push or tap the dowels into wheels,** as shown.

8. **Push or tap two wheels onto the other side of the axles.**

   **Congratulations!** Your toy can roll. Give it a push.

If you are going to do the optional Ramp Roll Lab, it’s now time.

Documents at [teachergeek.com/learn](http://teachergeek.com/learn)
Linkages are mechanisms which allow force or motion to be directed where it is needed.

Linkages can be used to change:
- The direction of motion
- The type of motion
- The size of a force

**Make a Linkage**

9. **Cut one strip in half.**

10. A) **Gather** the **two half strips** (from Step #9), and **two full strips**.  
    B) **Ream one end hole** on **each strip**.

11. **Cut two 1cm (1/2in)** slide stop sections.

12. **Attach a half strip to a wheel**, as shown. Make sure the dowel goes through the **reamed hole** in the strip. Use **slide stop** to keep the strip from falling off.
Experiment by creating and testing different linkage mechanisms. Add another linkage. Connect linkages together. Here are a few examples...

13 Roll the toy frame on a table or floor. Notice the motion of linkage (strip).

If you are going to do the optional Linkage Lab, it’s now time. Documents at teachergeek.com/learn

14 Use two screws & nuts to hold the linkage upright.

15 Use a section of slide stop, to attach another strip to a wheel. Make sure the dowel goes through the reamed strip hole.

Create a joint by turning a screw through the linkages. Do not ream the linkage (strip) holes. They should be able to rotate.
The Toy Challenge

You have been hired by the Geek Baby Company to design and prototype a new pull/push toy. The toy should have features that move when it is rolled.

Criteria: (things your design can not, or must, do or be)
The toy should:
- Be fun and innovative
- Use TeacherGeek wheels & linkages
- Function properly and reliably
- Be easy to use
- Be decorated with recycled and other materials
- Be given a name

Engineering Design Process:
You will be using the Engineering Design Process. What does that mean? Your design is never finished (it can always be improved). There is no such thing as a perfect design.

Materials:
Use recycled packaging, tape, markers, and other materials to make your toy “good looks”.

Fill out a new Engineering Notebook page each time you design/redesign your push/pull toy.
Ideas

Dog bobs head and wags tail

Boxers go up and down, forwards and backwards

Girl does jumping-jacks and head goes from side-to-side

Robot pivots and dog runs

Giraffe runs and moves head
Giraffe is missing body made from cereal box