If Doing This Activity With Young Children:
Have an adult assemble it first (using this build guide), and then give to children to tinker and engineer with.

WARNING!
Small Parts, Choking Hazard,
For ages 4 and Up.
Use only with Adult Supervision.
You’ll need these components to create one Gears & Pulleys Tinker Set.

8 - Pulleys
Two of the following pulleys:
- 9mm
- 25.5mm
- 55.5mm
- 70mm

8 - Gears
Two of the following gears:
- 10 Tooth
- 20 Tooth
- 40 Tooth
- 50 Tooth

2 - Blocks
1 - Slide Stop

2 - Hole Plates

4 - Dowels
5mm x 300mm (12in)

6 - Rubber Bands
Small (#16)

TeacherGeek Tools

This isn’t a kit. With TeacherGeek, you get to really build (cut, ream, screw). Here are tools you’ll need to get started. They can be shared, between kids/groups, if needed.

- TeacherGeek Multi-Cutter
- Tapping Block
- Small Hammer

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

Tools for ages 13 and above, or with adult supervision

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 into.

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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.

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**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.
Gears & Pulleys
Tinker Set - Build Guide

Build the Base

1. **Cut** four 3cm (1in) **dowels**.

![](cut_dowels.png)

2. **Tap** or push the **dowels** into two, stacked, upside-down **hole plates**.

![](tap_dowels.png)

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**Congratulations!**

*Your base is done.*

Now, it’s time to construct your **gears** and **pulleys** for your tinker set.

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**Tip**: Use a pencil sharpener to clean up damaged dowel ends. Don’t sharpen it to a point; only take a little off.

![](pencil_sharpener.png)

Dowel End fixed with a pencil sharpener.

Damaged Dowel End.
3 **Cut two 5cm (2in) dowels.**
These will become **shafts** for gears.

4 **Tap a shaft** into each gear center hole, so the gear is in the center of the shaft.

**Tip:** Tap the dowel through the center hole of a gear or pulley, and down into the groove on a wooden **tapping block.**

5 **Stack two gears** on the dowel to create a **compound gear.**
Slide one 0.5 cm piece of **slide stop** on single gear dowels – this will help each level, **mesh.**

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Adult supervision required for children under 12.
6. **Stack two pulleys** on the dowel to create a **compound pulley**. Slide one 0.5 cm piece of **slide stop** on single pulley dowels - this will help each level line up.

7. **Place gears** into the **base**. Position them so that the **teeth mesh**. If gears are too close, or too far away, the teeth will not mesh correctly.

8. **Keep experimenting...** Rearrange how the gears mesh.
**Pulley Mechanisms**

9. Place **pulleys** into the **base**. They should not touch each other. Use **rubber bands** (belts) to connect them.

**Bigger Bases**

10. Want more room to play with gears and pulleys? **Bases** can be combined using **blocks**.

If you are going to do the optional **Ratio Lab**, now’s the time.

If you are going to do the optional **Challenges**, now’s the time.

Documents at [teachergeek.com/learn](http://teachergeek.com/learn)